POPULAR AVIATION

Practical Mechanics

1932

NOVEMBER

25¢

S. Page 304

Luke the Balloon Buster

How Army Planes are Built

P. A. Model Contest

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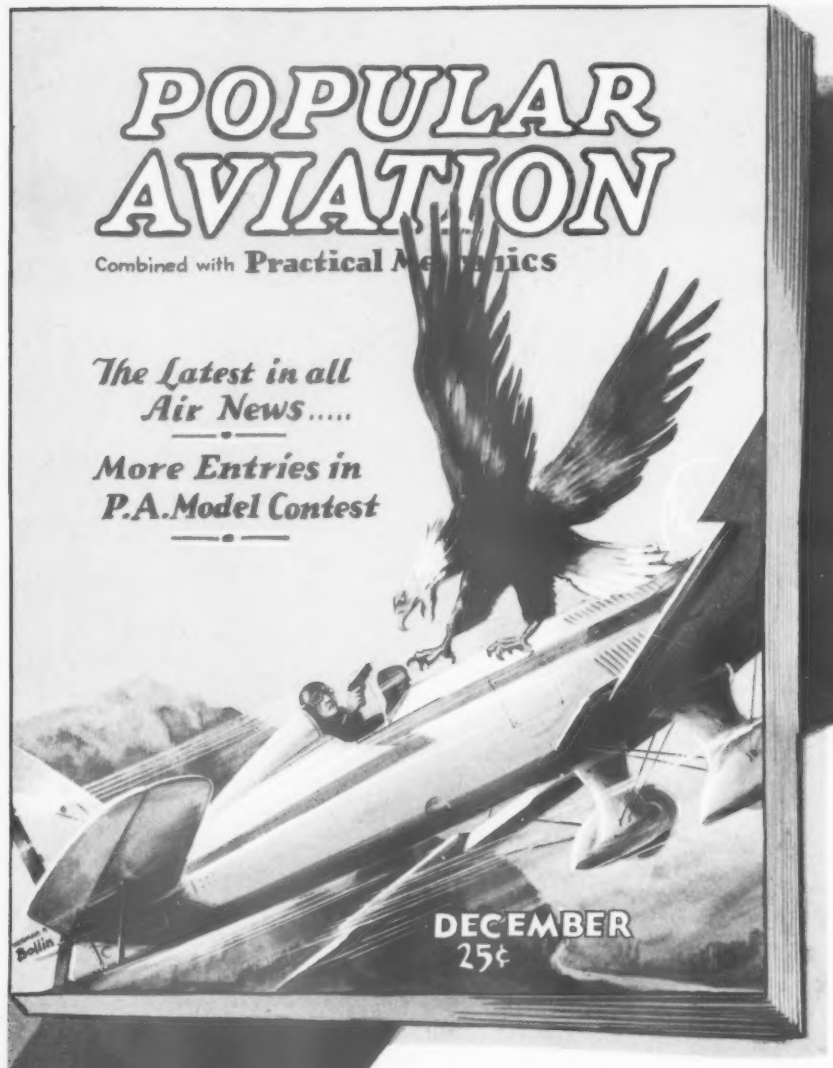

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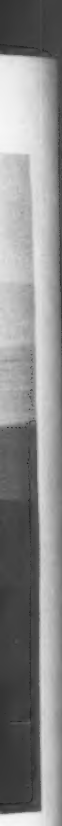

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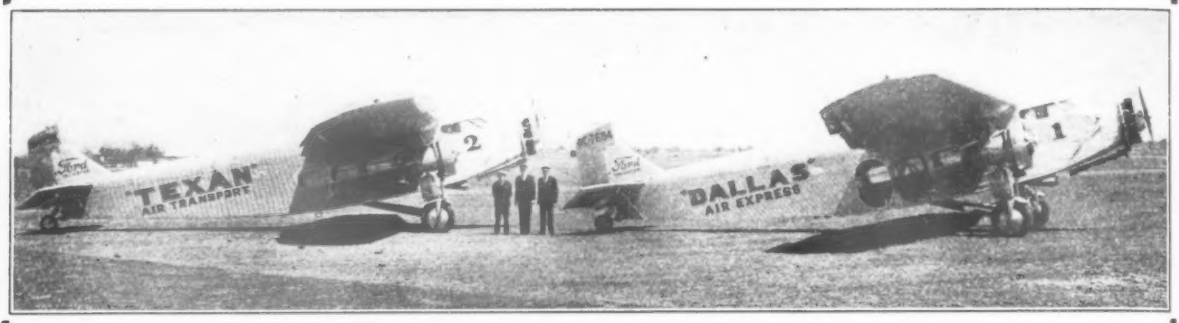

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OUTLINE OF CONTENTS

(Greatly Condensed)

Introduction: Comparison of bird flight with airplane flight—Ornithopter — Helicopter — Autogiro — Essential parts of airplane.

The Airfoil: Operation of wind tunnel and balance — Airfoil characteristics — Relation between lift coefficient and speed —Creation of lift — Explanation of drag — Characteristics of L/D ratio — Center of pressure travel — Effect of variation of airfoil dimensions — Thick airfoils — Distribution of load along chord of airfoil — Lateral center of pressure — Effect of aspect ratio — Use of taper in planform and thickness — Shape of airfoil tips — From model to airplane — Reynold's number and variable density wind tunnel.

Selection of Airfoils: Data and methods for comparing airfoils — Reasons for varying values of gap/chord ratio and stagger — Decalage — Pressure distribution tests — Mean chord of a combination of airfoils — Downwash.

Parasite Resistance: Struts—Wires — Fittings — Wheels — Fuselage — Landing Gear — Tail surfaces — Radiators, core, plate, wing — Engine drag — Miscellaneous Parts — Interference — Determining equivalent flat-plate area — Retractable chassis.

Propeller: Propeller as a group of airfoils — Propeller design procedure — Tests — Three or four-bladed propellers — Selection of propeller design for a given airplane — Controllable and automatic propellers.

The Complete Airplane: Four units of complete airplane — Ground speed, air speed, relative wind, angle of attack — Equilibrium in climb, glide, dive — Determining stabilizer setting — Determining ability of elevators to balance airplane — Model tests — Proper position of thrust line, of center of resistance — Conditions of balance required.

Stability: Determining dynamic stability and static longitudinal stability — Effect of position of c.g. with respect to wing chord — Lateral and directional stability — Dynamic stability in flight.

The Control Surface: Differential aileron control — Balanced control surfaces — Frise Aileron — Auxiliary methods of lateral control — Formulas for control surface design — Special cases of rudder use.

Performance: Horsepower-required curve for different altitudes — Landing speed — Best gliding angle — Endurance and range — Corrections for speed and scale effects — Other methods of performance prediction — Characteristics of airplane that affect performance — Official tests.

Dynamic Loads: Accelerations occurring as a result of sudden changes in angle of attack. Time histories of power-on and power-off pull-ups at 181 m.p.h.; of right and left barrel rolls and a right spin — Inverted flight — landing and taking off.

Materials and Construction: Features governing design—Use of wood and metals — Retractable landing gear — Single-wheel chassis — Oleo gears — Landing gear — Shock absorbing wheels — Brakes — Tail skid — Skis — Wing, fuselage, tail coverings.

Equipment: Parachutes—Aircraft instruments — Electrical equipment — Radio.

Navigation: Choice of course—Meteorology in navigation — Maps — Compass errors — Effect of wind on course — Interception — Great circle courses —Maintaining direction—Drift correction — Position finding.

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An Airy Chat With the Editor

WELL, the summer flying season is nearly over in the northern states, and the rest of the year's activities will be reported from Florida, California and points south.

* * *

THE usual transatlantic flights were pulled off, which seem to progress independently of other conditions—prosperity or no prosperity. However, among the salt water hoppers, there are two that have aroused our sincere admiration—Amelia Earhart Putnam and Mollison. Their flights were real accomplishments—not merely publicity stunts.

* * *

THEN, we have had the stratospherists to amuse us and to introduce a note of comedy into what might otherwise have proved to be a rather dismal year. Shooting off cast iron rockets seems to have captured Europe by storm. Mebbe they're right, but I just don't see it.

* * *

HAVE you noticed the great quantity of European news that we have been carrying the last few months? It is all out of proportion to the usual space devoted to foreign activities, but we were forced to it. Why? Well, practical experimental work along wholly original lines seems to have died a death in the U. S. A.

Certainly, there are a whole swarm of inventors with brand new ideas and nice red-sealed patent papers, but mighty few of them have been able to arrive at the point where they could work out their brainstorms in wood, metal and fabric. There seems to be plenty money loose for this purpose in England, Germany, France and Italy but not in this country. For every American photograph of a new development that comes into this office, there are at least ten photos from Europe. Being patriots we hate to acknowledge this fact, but unfortunately it is true.

* * *

DID you hear about the near-strike of the race pilots at the National Air Races? Well, this is one way of handling a situation and we're back of them.

* * *

AND did you hear about the women contestants at the races taking off in the face of a line-squall? Well, the gals battled it through with no casualties, but it was a real battle and a demonstration of real flying ability. Some of those guys in charge should study our elementary lessons in meteorology—but they won't. Maybe we can get Jim to write them a letter!

* * *

THEY may have creaky joints and silvering hair, but the Early Birds are right on the job. You know, the Early Birds is a very exclusive aeronautic association comprised of members who aviated prior to the year 1914. And there's quite a bunch of them left who made merry at Cleveland. Greetings to them all.

* * *

WE HAVE a very interesting biography of Frank Luke, the "balloon buster," that should prove attractive to the war minded reader. His daring exploits will ring down through the ages as the most astounding of the World War aerial fighting men.

* * *

DID you ever go to one of these racketeer air-races, where you pay general admission, then pay some more to sit down, more for parking your car, more for a program, more for a cushion to put on your chair, and so forth?

By the time you get done paying, you have been socked the price of admission to Grand Opera.

Why not make one cash payment at the gate instead of spending money all afternoon? Make the admission cover everything. There should be a law governing this matter.

* * *

HAVE you sent in your model photograph for our contest? Better start now.

* * *

BUTTON — button — who gets the next National Air Meet? Chicago should have it in 1933 because of the World's Fair that is being held in that city during 1933. Chicago seems to be the logical selection in view of the great number of people that will attend this big fair, and who of course, would equally patronize the National Air races during their visit, thus killing two birds with one stone.

'Way back in 1893, when the first Chicago World's Fair was held, the turnstiles recorded 30,000,000 paid admissions. If this attendance could be registered in 1893, then we can at least expect an approach to it in 1933. How many can we expect to attend the National Air Races in Cleveland while the World's Fair is being held in Chicago—several hundred miles away.

* * *

LOOKING over the letters received, we see one that appeals to us. This is from Jack Macy, Chicago, Ill., who speaks his mind in this manner:

It seems to me that it is about time to lay off this so-called streamlining stuff and attack the engine problem. By refining the plane here and there, adding pants or taking them off in favor of retractible gear, it would seem that we have about reached the limit.

Now, I suggest tackling the engine problem and show a better efficiency at this point, which is sorely needed. We could double the output of the present day engine and still be a long way from 100 per cent efficiency. Truly, they are playing around with rockets, and trying to climb up into the stratosphere where the air is thinner, but I don't think that this is getting us anywhere—at least during our lifetime.

Even though the more efficient engine might be a little heavier, it would be well worth the attempt if the results were commensurate with the increased weight. By this, I mean, that if the weight were doubled and the new engine showed only 10 per cent better than twice the former efficiency, the game would be well worth trying.

Very true, within limits, but still we are a long way from perfection in streamlining and the reduction of parasitic resistance in general. Now let us assume that the lift-drag ratio of a certain ship is 16.0, which is just another method of stating that one pound of propeller thrust will suspend 16 pounds of weight. Now it is evident that an increase of one pound in the head resistance would be equivalent to increasing the weight by 16 pounds. Thus, we see that a reduction of one pound in the resistance would be the equivalent of removing 16 pounds of weight. We would sure have to trim down the weight of the powerplant considerably to gain the same results as trimming off one pound of head resistance.

* * *

THERE is a smug little colony of wise-guys in this country who claim that wing-slots can add nothing to the

(*Continued on page* 324)

POPULAR AVIATION

Combined with Practical Mechanics, Including Aeronautics and Aviation Stories and Mechanics

A Magazine for the Promotion of Amateur Aviation and Private Flying

Volume XI NOVEMBER, 1932 Number 5

TABLE OF CONTENTS

FEATURE ARTICLES

An Airy Chat With the Editor 278
The Career of Frank Luke—The Balloon Buster 280
Two Parachutes Better Than One 283
Here's the Grandaddy of the Blimp 286
A Cruise With the Blimp "Volunteer" 287
Our Warplane Photo Phanatics Club 289
How Army Planes are Built for Uncle Sam 290
Jumping Them off the Grass 293
Timing Aircraft Performance 295
The Why and How of Bombing 297
Doings of the Aero-Sportswomen 299
An Early Bird Views the Races 300
Flying with One Foot on the Ground 301
Howl Department for Amateurs 303
Simple Lessons in Meteorology 305
Getting Speakers for Aero Clubs 307
Questions and Answers Department 309
A Page of Practical Mechanics 311
What Our Readers are Building 313
POPULAR AVIATION First International Model Contest 316
Ideas for Our Model Builders 317
Building the Bellanca Skyrocket Model 320

THE PICK OF THE BRIEFS

A Flyweight Four-seater Arrives 282
Monocoque Fuselage Construction 282
Lightolane Endurance Record 284
Airplane Launched From Terraplane 284
New Type of Traveler 285
Closeup of Russell Thaw's Racer 285
Here's a Small Racing Plane 285
An Early Fairchild 292
Blanche Scott, Early Aviatrix 294
Biggest Blimp Nears Completion 294
A Flying Freight Train 296
Aviation in England 299
A Radically Different Airplane (Cover Story) 304
Fast Travel With the Rocket Ship 308
This Candelabrum is Simple but Beautiful 311
Fireworks Display 311
You May Need This Stove 312
It's Easy to Make This Magazine Rack 312
A Kansas Lightplane 313
He Builds a Hang Glider 313

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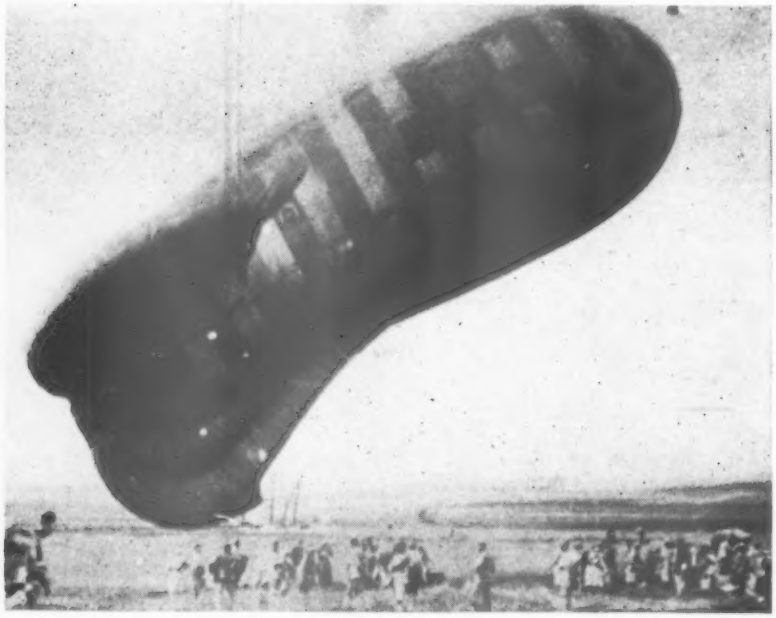
The Career of Frank Luke

by

CARL B. OGILVIE

Noted authority on wartime air-history.



A kite-balloon, alias a "Drachen", alias a "Sausage balloon" which inspired Luke with intense hatred.

THEY called him the Bad Boy of the A. E. F. Air Service. They said as a soldier he was a washout; as an officer-pilot a total loss. They didn't like him because he was headstrong; an over self-confident boaster. He was suspected of being a spy because he was of German extraction.

He was charged with insubordination and ordered arrested on sight. He laughed in the face of his superior officer—thumbed his nose at Fate. He flew only the most dangerous trails of war-torn skies—trails of death marked with the most difficult targets in the air —"sausage" balloons. The Bad Boy concentrated his incredible courage and fighting skill upon enemy O. B.'s.

Disliked by his comrades, he became America's most amazing and outstanding air hero. He was the first American pilot to be awarded the highest military honor our country can bestow —the Congressional Medal of Honor. The Bad Boy of the Air Service was Second Lieutenant Frank Luke, Jr., of Phoenix, Arizona.

Frank Luke saw but 17 days of duty at the Front. Rigid disciplining of a stern superior officer kept him grounded so that he had but nine days of actual combat flying. But those nine days have been written into the annals of the Air Service as the most glorious and remarkable days of any one pilot, not only of our Air Service, but of all pilots or all air forces of the world. There is no question that Luke was the Ace of Heroes of the World War. He will prominently and rightfully stand in a pre-eminent class of his own making —Ace of American Balloon Strafers.

His unflinching courage was as great as his recklessness; his fighting heart as strong as his savage deadly fighting technique. He fretted at petty restrictions of army discipline; he refused to play the game of war according to set regulations. Fighting in the air was a quick dive, a burst of Vicker's lead, a sharp zoom, then a half-roll and a full-throttled charge at the nearest remaining enemy—a catch-as-catch-can struggle. And Luke defied anyone to tell him when and how he was to fight.

THIS intimate biography of Frank Luke is the first of a series of biographies treating of wartime pilots and air-fighters. A most interesting study of the men, their habits and personalities. A second air-hero biography will follow shortly.

Some said he was a rebel; a young, headstrong Southwestern outlaw. That there was something of both the rebel and the outlaw, stirring the red blood surging through the veins of that Southwestern lad, there is sufficient evidence. Yet there is no doubt that he was a red-blooded American, an intense patriot, a fearless amazingly skillful marksman and deadly fighter. The pity is that America didn't have more so-called rebel-outlaws in the Air Service. No one approached Luke's brilliant record of downing 14 enemy balloons and four enemy planes in only nine days of fighting. A consistent and unequalled record of two averaged victories for every day he fought.

Luke was just a lad, twenty-one years old, when he shot down his first balloon on September 12, 1918. He had lied about his age to enlist exactly a year before.

Within 15 days after his first success at "strafing the sausage," he was to be shot dead, the first ranking ace in number of victories in the U. S. Air Service. But within that short time he was to fly only eight days (he had made one previous flight and shot down a German plane), and run up the astonishing big score of 18 official victories.

AFTER being grounded by his superior officer during the last two weeks of August and the first 11 days of September for breaking formation, Luke led an open one-man revolt against his C. O. He had heard that balloon strafing was the most difficult and dangerous task an airman had to perform. The 27th Squadron was a pursuit squadron.

After getting his first sausage, Luke decided to concentrate his activities on the big bags whose observers menaced the American forces locked in a death struggle with the German infantry. Some say Luke went haywire; he openly boasted there wasn't any army regulations that could keep him on the ground. He deliberately broke rigid orders by leaving formation to go off hunting on his own. He became an enigma, the Bad Boy of the Air Service.

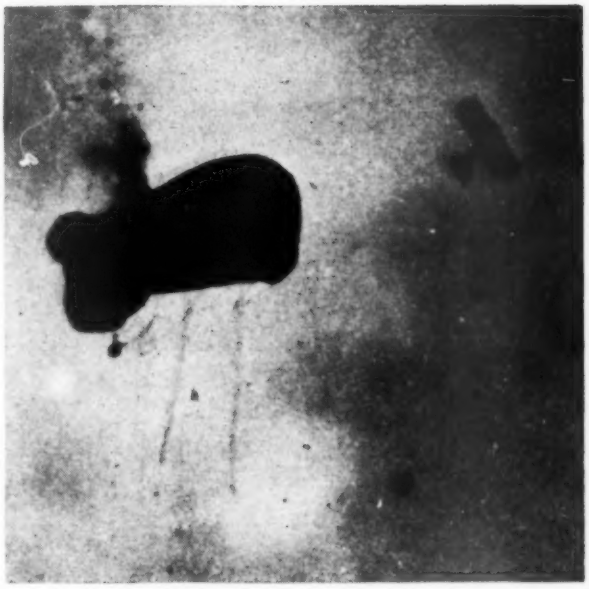
Two days after his first balloon victory, Luke surprised Squadron 27 by shooting down two balloons. The following day, Sept. 15th, he astonished the Allied Brass Hats by running up a victory such as no other pilot had ever achieved. He shot down two balloons in the morning and got a third one in the afternoon.

He found that the greyness of twilight aided him in maneuvering close to the enemy balloons. It was then that he originated the system of going over the German line about sunset and swooping down on the balloons as the German observers were making their last observations of the day.

September 18th was the brightest day of glory in Frank Luke's brilliant career. He won five victories in the amazing time of only ten minutes. It was

—The Balloon Buster

A THRILLING story of the fierce fighting heart that was Luke's. Among the first of the American Aces, he averaged two victories each fighting day, venting his spleen principally upon the German observation balloons or "Drachens" that directed the enemy artillery fire. Undisciplined, rebellious and entirely reckless, yet a wonderful fighter.



A German sausage balloon going down in flames just after an attack by the plane in the upper righthand corner.

also a tragic day for him. His only friend in Squadron 27, Lieutenant Joseph Wehner, went to his death—shot down in flames.

Winging above historic St. Mihiel, Luke was accompanied by Wehner on a hunt for sausages. It was agreed that Luke was to attack and Wehner was to protect him from above. Above Labeuville, two enemy balloons swung lazily at their cable tethers. Luke waved to Wehner and climbed swiftly in the fading sunlit sky.

Reaching the desired altitude, Luke poised for the sudden swift downward plunge. Wehner stayed behind and Luke went down with the speed of a striking thunderbolt. He registered on the nearest and highest balloon. Downward he came toward it. The German anti-aircraft batteries were silenced, so close to the bag was he, but a steady stream of machine gun fire was directed at him from the ground.

Luke banked slightly as the ground crew worked frantically to winch the bag down. The observer saw the drop of the Spad swirling straight toward his balloon. He bailed out to drop to earth safely with a parachute. Now the balloon was dead in Luke's sight rings; his fingers eagerly pressed the machine gun trips. A burst of tracer and incendiary bullets. The sausage began smoking and, as oxygen mixed with its gas, it burst into angry red flames.

With a zoom and roll, Luke climbed straight at the second balloon. His Vickers spat ribbons of red flame. He struck the bag a fatal blow from the underside. Luke looked up, saw Wehner with a formation of Fokkers diving on his tail. A Fokker dove down viciously to attack Luke.

The lad from Arizona went racing to meet the German as he came easily out of his dive. Luke dressed his ship, sent a short burst with both guns into the Fokker cockpit. The German veered off; went into a dive of death. Quick as a flash, Luke was on a second Fokker and riddled its pilot with lead.

WHEN Luke banked and climbed for altitude, Wehner was nowhere in sight. Those Fokkers up above had shot him down in flames while Luke was winning victories. Believing Joe had hiked for home, Luke set a course for the American lines. He saw a German observation plane and whipped in ahead of the ship. An accurately directed stream of fire sent the two-seater down to earth, a trembling wounded bird of war.

The short fierce battle was over in ten minutes. Two balloons, two combat planes and one observation plane—five in one brief, but savage struggle. A five-in-one-day victory record equal to those of Fonck, Bishop, McCudden and Mannock.

But Luke paid a heart-breaking price for these victories. He lost his pal and only friend, Lieutenant Joseph Wehner. Then war in the air ceased to be routine of daily patrols. It became a tragic and deadly personal affair to Luke. He swore to avenge Wehner's death every opportunity he could get.

Luke forgot his superior officer, forgot his unfriendly comrades, forgot everything in his savage desire for retaliation. He set out and accomplished an amazing one-man war against the German balloon service. And each time he returned from the fray he brought a plane riddled with bullet holes.

Every day, hour after hour, Luke was on the wing ferreting out enemy sausage balloons, leaving the German planes for men less reckless and daring than he. The official record of 27th Squadron was to read, at the end of the war: 314 patrols; 230 combats; 54 victories. Luke was to engage in many of those combats and win a third of the victories. The record was also to list 21 casualties — eight killed; four wounded; seven prisoners and two missing. Luke swore never to be taken prisoner.

Luke was ordered to take a two weeks' leave of absence and went to Paris. But he couldn't enjoy himself. Wehner was gone! Fighting was in his blood; there were scores of enemy balloons tethered over the lines, each one a challenge to his courage and skill. Six days later he returned to his base and requested immediate combat orders. Two days later he was to leave his field against orders; his arrest was to be requested and Luke was to land on German soil to be listed among the dead —not the prisoners.

Luke's C. O. had ordered him grounded. The Arizona lad, angered by the seeming injustice, took off and

Down and crashed were the ships strafed by Frank Luke. This is said to be one of Luke's workmanlike jobs.

flew to the American Balloon Headquarters at Souilly. He dropped a note typical of Luke's supreme self-confidence; it read:

"Watch three enemy balloons on the Meuse. Luke."

Near Dun, on the opposite bank of the Meuse, Luke's Spad went down on the first of three bags he saw up in the growing twilight. His machine guns chortled a Hymn of Hate. The big bag began burning. Luke headed for the Briere Farm; he went down on the second balloon.

But the German ground crew were on the alert; they began pulling their sausage down. Luke lost his prey in the first dive.

He felt a jolt in his side. That searing hot pain was a new experience for him. He banked through threads of tracer smoke.

A Fokker on his tail! He was shot. He still had two balloons to get. He had boasted of getting three.

LUKE'S Spad heeled over, went down. The German pilot thought he had a victory. When within ninety feet of the ground he saw the Spad's nose come up. A stream of bullets shot toward the descending balloon. It burst into flames.

Number Two was going down in flames.

Ground crews were working their Spandau machine guns furiously. The plane trembled under the impact of their hail of lead. There was blood on the instrument board before him when Luke headed toward Milly, nine miles away.

One more balloon to get—he must keep his word. For the first time in his short thrilling adventurous life, Luke wondered if he could make what he had set out to do. Was he to die? If he was he'd do the way Joe Wehner had—die fighting.

His wings were too riddled to climb. He hedge-hopped over trees and houses. A quick kick on the rudder—a pull on the stick. The nose of his Spad zoomed upward toward the third balloon. His Vickers trembled on the cowling. A long burst and the sausage was going down.

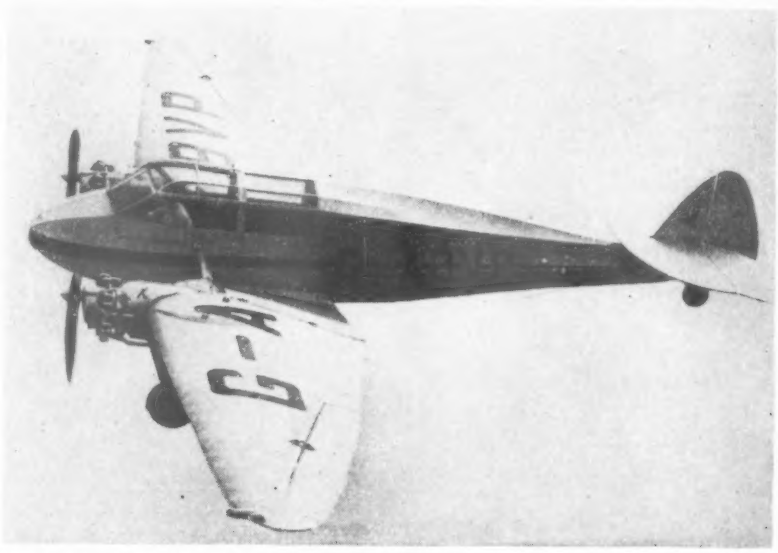
Victory! The third bag was smoking. He had said he would do it! And now the problem rose dimly in his mind—the problem of escape now that he had accomplished his mission.

Luke's plane was so badly damaged he could not gain flying speed. It sank slowly to earth and Luke made a forced landing in a churchyard at Murvaux. Painfully he crawled out of his Spad, drew his service automatic from its holster and fired at German troops running toward him to take him prisoner.

He fired until his pistol was empty. Mauser rifle bullets found his bleeding body. He slipped off into the Valhalla

(*Continued on page* 332)

A Flyweight Four-Seater Arrives



Showing the twin wing-engined job in flight. Note the excellent visibility from the cabin.

A LIGHT-WEIGHT four-seat plane with folding wings has been introduced in England where it was recently test flown by Lieut. H. M. Schofield, a Schneider Trophy pilot.

This new ship has many novel points which include monospar wing construction, twin wing engines and folding wings, the latter making the ship very compact for storage.

It is suited for a salon passenger craft, ambulance, mail-carrier or freight transport. Because of its construction, the visibility radius for the passengers is exceptionally good.

Monocoque Fuselage Construction

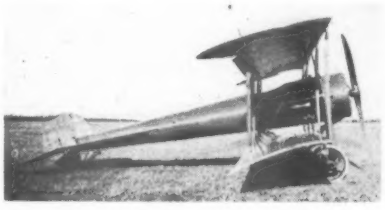
A 1912 Deperdussin monocoque at the Gordon-Bennett races.

THE search for simplicity in fuselage construction naturally led to the development of a single piece structure to take the place of the complicated trussed fuselage. This single piece body is known as a "monocoque" type.

Now, the monocoque body is nothing new, for in 1911, we frequently found cases of bodies of this type, formed by wrapping thin wood strips around a form and glueing them in place. Examples of this construction will be found in the Deperdussin racers, the German Roland scouts and others.

Later, metal shell monocoque fuselage was produced experimentally in several ships from 1918 to 1920, but was finally discontinued for various reasons. Sheet metal shells were reinforced by formed stiffeners on the inside, so that the outer part of the shell was smooth and worked to streamline form.

In this country, the earliest examples of this construction were the L. W. F., the Longren and the Ricketts, all of which were formed of wrapped wood strips glued up in layers.



A Longren monocoque fuselage of an early date, built in Kansas.

Two Parachutes Better Than One

by FALK HARMEL

Stirring incidents in many parachute jumps where the second chute pack saved the day. Jumpers formerly rebelled against the second pack until experience converted them.

"DO YOU expect me to load myself down with this extra parachute?"

"That's the idea."

"Well, I won't do it. I have made lots of jumps with my own 'chute and I don't need your old Army 'chute."

"Young lady, I must insist on it. Let me tell you, that as Commanding Officer of this field, it is my duty to enforce the War Department regulations which make it compulsory for everyone flying in an Army plane to wear the Army type parachute. If you refuse to wear it, I cannot permit you to make your exhibition jump over this field."

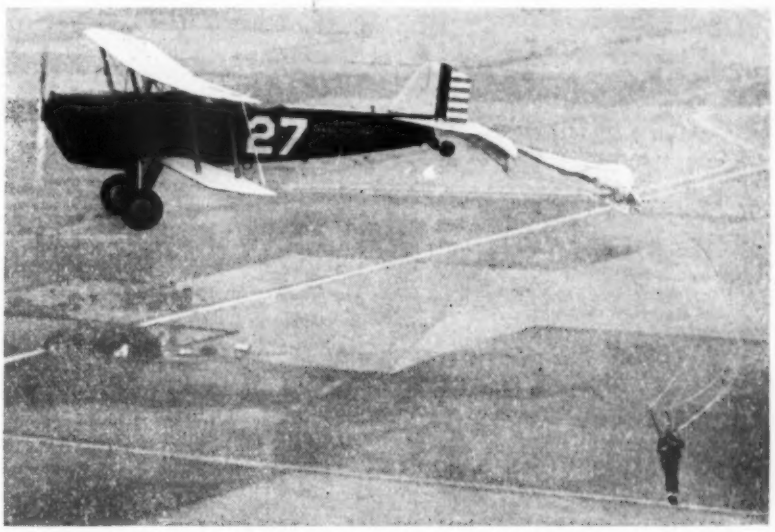
And that about ended the argument between Mrs. Irene McFarland, professional parachute jumper, and Major Edward L. Hoffman, Air Corps, at that time commanding officer of Grissard Field, Cincinnati, Ohio, and the man who perhaps more than anyone else was responsible for the parachute reaching its present stage of perfection.

It was quite obvious from the above conversation that Mrs. McFarland did not take kindly to the Army parachute as an additional burden on her shoulders. She objected to its clumsiness and declared it an imposition to be weighted down with additional harness. The Major, however, was deaf to her pleadings and so rather than disappoint the crowd she reluctantly donned the parachute he offered her.

Major Hoffman, who had been engaged in parachute development work since the World War and who was presented the Collier Trophy by President Coolidge for the outstanding work he performed in perfecting this lifesaving apparatus, had examined the private 'chute Mrs. McFarland intended using and slowly shook his head.

THIS parachute was packed in a bag fastened to the axle of the landing gear of the airplane. A rope secured to the parachute harness she wore was tied to the parachute in the canvas bag container. The mouth of the bag was drawn together to a diameter sufficiently large to allow the parachute to be pulled out readily when sufficient weight was exerted upon it.

After she donned the Army 'chute, Mrs. McFarland, practicing before the take-off of the airplane, experienced difficulty in getting in and out of the forward cockpit. In putting it on, she was forced to move the harness of her exhibition 'chute higher up on her body, which resulted in shortening the length of the rip cord leading from it to the parachute in the canvas bag, making it difficult to manage.



Here is a photo of Private Harold R. Osborne whose chute fouled the tail of the plane. He is hanging from the tail by the shroud lines.

Some delay then ensued until the harnesses of the two parachutes were adjusted to her satisfaction, following which she waved to the crowd. The pilot opened the throttle and the airplane skimmed over the field to its take-off. When the proper altitude was reached (3500 feet) Lieut Watson, the pilot, turned the plane toward the field to afford the spectators a close view of the parachute jump.

Irene McFarland is now a strong advocate of the second chute after a harrowing experience.

Everything being in readiness for this stunt, he gave the signal to his passenger. Mrs. McFarland arose from her seat, leaned over the edge of the fuselage and jumped out into space. Something went wrong. Her drop was exceedingly short.

Instead of the exhibition parachute slipping out of its canvas container, as it was supposed to do, it stuck and Mrs. McFarland was left dangling just a few feet beneath the airplane by the short piece of rope which was tied to the parachute. There she hung 3,500 feet above the earth—a swinging human pendulum!

To bring the airplane down to the ground for a landing was out of the question, for it would have resulted in Mrs. McFarland being dragged along to certain death before the plane could be brought to a standstill. Thoroughly frightened, she looked up imploringly at Lieut Watson. In implicit confidence in the Army parachute, he made signs to her to pull the rip cord.

Danger seemed to dog both the pilot and his passenger, for when the Army 'chute opened she was jerked backward and downward, breaking loose the exhibition 'chute, but the folds of the Army 'chute appeared in a fair way of becoming entangled in the tail surfaces of the airplane. With the parachute fouling the tail surfaces, Lieut. Watson would have been unable to

control the upward or downward movement of the plane.

IN A desperate effort to clear the tail of the airplane from the folds of the Army 'chute, Lieut. Watson yanked the control stick backward to place it in a steep climb. His maneuver bore successful results, and he was extremely happy to see the Army 'chute lazily float his erstwhile passenger down in safety.

Whatever Mrs. McFarland's feelings toward Major Hoffman may have been prior to her jump, she felt only gratitude to him by the time she reached the ground. Thus she became the first female member of the Caterpillar Club —No. 22, to be exact—and also a member of the Practice Parachute Jump Circle, now numbering eleven men and women.

Caterpillar No. 1, in the P. P. J. Circle, is William O'Connor, who in the early days of the Air Corps Engineering Division, then located at McCook Field, Dayton, Ohio, came to that field to demonstrate a privately manufactured parachute. Officials at McCook Field insisted that Mr. O'Connor wear the Army parachute in addition to his own. There was considerable opposition to this requirement, both on the part of Mr. O'Connor and the inventor of the parachute, who was also present, but they soon learned that War Department regulations are not mere scraps of paper.

Mr. O'Connor made the jump at 2,000 feet. He fell about 1,500 feet while trying desperately to make his own 'chute open and he only ripped the Army 'chute as a last resort. Fouled cordage, it was found, had prevented the opening of his 'chute. Thereafter he had more respect for Army regulations and, incidentally—the Army parachute.

Wilfred Bottomfield, listed as No. 2 in the P. P. J. Circle, was scheduled to make an exhibition jump at an Air Circus, Kelly Field, San Antonio, Texas. He intended taking five 'chutes with him, open one at a time, and descend in this manner. Before going aloft he was persuaded to take along an Army parachute. It is not recorded whether or not he was also a conscientious objector.

After Bottomfield jumped, his first parachute opened nicely, but when the others were released his troubles began. In vain he tried to make them function, but they had become so entangled in one another that he was forced to resort to his ace-in-the-hole —the Army parachute. It did not fail him.

TWO years after Mrs. McFarland became the third member of the Circle, Mr. Art Smertz filed his application and was admitted. Mr. Smertz, a resident of the Mormon State, advertised himself as an aerial daredevil. Parachute jumps were his specialty. He had read where a parachute jumper had fallen purposely several thousand feet before pulling the ripcord of his parachute and he resolved to eclipse that record.

Mary Fahrny is also a believer in two packs.

An air-circus was staged at Ogden, Utah, by Air Corps Reserve officers of that state supervised by Lieut. Russell L. Maughan of the Air Corps Regular Army and some commercial birdmen headed by Tommy Thompson. Before going up in the plane piloted by Charles Mayse, Smertz wisely heeded the advice of Lieut. Maughan and accepted the Army parachute the latter proferred him.

When Mayse reached about 4,500 feet, Smertz leaped and headed like a plummet for terra firma. "At about 1,400 feet," Smertz afterwards said, "I found myself on my back and decided to open my parachute. The jerk of it, however, broke the harness and severely jarred me. In a semi-conscious state, I remembered the extra parachute on my back and just before I lapsed into unconsciousness, I managed to get it open."

Almost a year following Smertz's narrow escape, Ralph C. Wensinger joined the little exclusive circle of eleven daredevils. He left the Cleveland Airport in a Travelair plane, piloted by Stewart Kramer, with the intention of making an exhibition jump at Chippewa Lake. The parachute Mr. Wensinger intended to use was an exhibition type stuffed into a bag which was tied to the airplane—a la Mrs. McFarland's type. In addition to his exhibition parachute, he wisely wore another parachute of an approved standard type as an emergency measure.

Wensinger jumped from an altitude of 2,000 feet. His drop, instead of pulling the parachute out of its bag, tore the container in two, leaving a ring of canvas around the parachute in such a way that it could not open. Wensinger dropped within 500 feet of the ground in an attempt to get the 'chute clear. He then pulled the ring of his emergency 'chute, which opened promptly and saved him from certain death.

(*Continued on page* 333)

Lightplane Endurance Record

HAROLD ALFORD, River Forest, Ill., broke the world's lightplane endurance record at the American Legion Air Meet in Chicago, Sept. 11. He flew a Taylor Cub powered with a Continental A-40 engine.

Alford took off at 6:24 a. m. and landed at 5:31 p. m., with a total of 11 hours 7 minutes in the air. This breaks the former record of 8 hours 17 minutes, held by I. Cochiasu and G. Grozia of Rumania made with a Klemm lightplane.

This flight was made with 30 gallons of gasoline and one quart of oil, a remarkable performance in point of economy, and one that was much applauded at the meet.

An altitude ranging between 2,000 and 3,000 feet was maintained during the flight, and no engine trouble was experienced.

Airplane Launched From Terraplane

POSSIBILITIES of launching an airplane from a restricted field have been brought to light by a successful experiment performed in Los Angeles, California. An airplane successfully took off from the top of an Essex Terraplane.

Prominent airplane pilots and experts stated that the superior acceleration of the modern automobile enabled the plane to reach flying speed in a much shorter distance than would be possible by the plane alone. The plane took off in 350 feet.

The feat was accomplished by O. C. (Boots) LaBoutillier, movie stunt aviator, who was piloting the plane, and Frank Randall, who was driving the Essex Terraplane.

Air mail officials, and others interested in commercial uses of the plane, are reported to be very much interested in the development of further experiments along this line.

Here's the plane mounted on the car scaffold and ready to start.

New Type of Traveler

AIR lines should not be regarded primarily as a competitor of the railroads.

Rail lines sell combination rail-plane tickets. Frequently the public can be best served by rail-plane rather than all-rail or all-plane service.

Much of the business of the airplanes is not subtracted from railroad revenue. The airplane has developed an entirely new type of traveler. The advantages of leaving New York this forenoon and arriving in Yellowstone, Yosemite or Rainier National Park tomorrow evening attract the vacationist who would not spend eight days out of a fourteen-day vacation getting to and from these western parks.

Cleveland business men board planes in the morning and have breakfast aloft; spend most of the day in Chicago and return to Cleveland for dinner. Without this service their trips to Chicago would be less frequent.

Limitations of the airplane prevent it from becoming a freight carrier and freight is still the big revenue producer for the railroads. The airplane, however, will attract a growing volume of lightweight, valuable merchandise which can afford to pay a premium for speed.

A move in this direction was the recent action of the Railway Express Agency and four pioneer airline companies in entering into a contract which reduced air express rates 40 to 80 per cent.

Air express is in its infancy; but in this era of small stocks, quick turnover and speedy replacements air transportation does have a place in the business picture.

Air Corps Chief's First Plane Flew 42 MPH

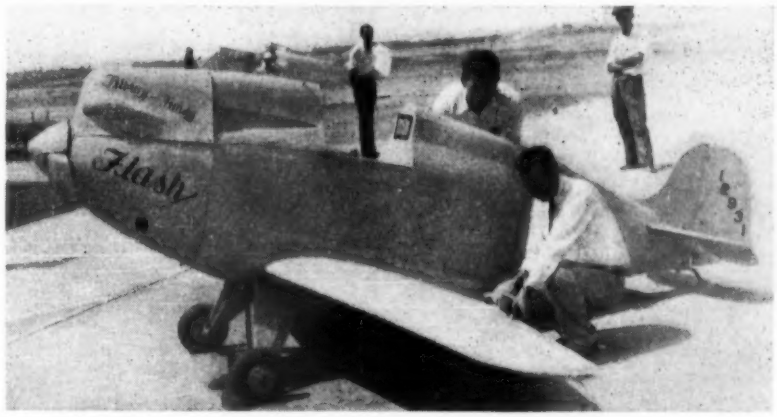
MORE than two decades ago Benjamin D. Foulois and Orville Wright flew the first Army plane at a speed of 42 miles an hour during a ten-mile test flight to establish a world's aviation speed record.

On a recent visit to the Boeing Airplane Company, Major General Foulois, now chief of the Army air corps, inspected the newest fighting plane which has a speed of well over 200 miles per hour.

The Army air chief was taught to fly by the Wright brothers, and with Orville made the historic flight with the United States' first military plane in July, 1909. They flew from Fort Myer to Alexandria, Va., and back, scoring an international altitude record by reaching 600 feet elevation, as well as setting up a speed mark by averaging 42 miles an hour.

Speed is the keynote of the latest Boeing Wasp-powered pursuit, a low-wing metal single-seater monoplane, whose top speed of more than 200 m.p.h. and diving speed of nearly 400 m.p.h. were undreamed of.

Here's a Small Racing Plane



This is the miniature racing plane "Flash", an original lightplane design.

THIS miniature racing monoplane, "Flash", is one of the smallest airplanes in existence. It was designed by Owen Tilbury who was assisted in its construction by Cecil Fundy, both of Bloomington, Ill.

It has a wing span of 14 feet; is 11 feet, six inches long and stands 3 feet, six inches high. Powered with a 45 h.p. engine, it is claimed to develop 150 m.p.h. on straight-away flights. This is a mark to aim at by our home constructors.

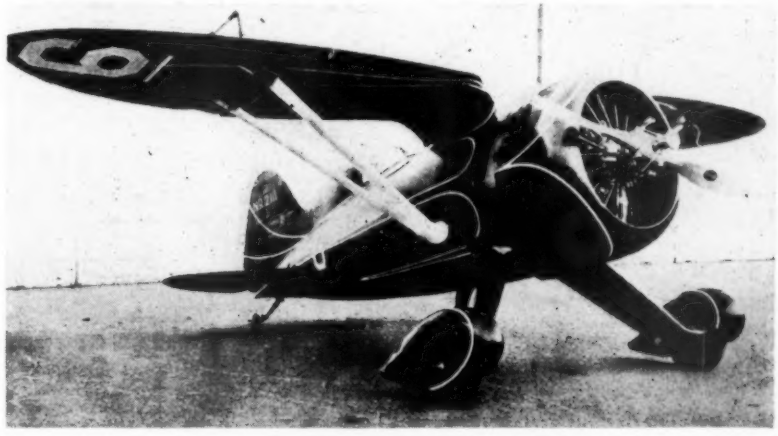
A Closeup of Russell Thaw's Racer

BELOW is a striking photograph of the racing plane entered by Russell Thaw in the attempt to smash the trans-continental record. This picture gives a better idea of the ship and its construction than the preliminary sketches shown in the September issue.

Probably the most noticeable feature of the ship is its "gull-wing" construction which is claimed to do away with many of the turbulence losses commonly experienced when the wing enters directly into the body or is supported by cabane struts. The wings are of elliptical form and are braced by "Vee" struts running from the body to about the center of the wing.

A variable pitch propeller is driven by a 750 "plus" horsepower engine, the engine being of the radial air-cooled type with an exposed frontal area. This type of propeller makes it possible to realize the maximum efficiency of the power plant throughout most of the speed range, thus utilizing all of the available power.

Spatted wheels are carried by self-supporting landing gear struts without exposed axle or other speed reducing structural members. And yet, it would seem, that retractable landing gear would have been a still greater improvement in view of the fact that such gears are fairly well developed. The complete elimination of the wing struts and landing gear would have added many more m.p.h. which was just what young Mr. Thaw needed in the contest.



Three-quarter view of the Russell Thaw racing monoplane, designed by Robert L. Hall and Z. D. Granville.

Here's an Old Timer — You Bet

Side view of the Burgess-Dunne "Vee" wing ship.

HERE we see the old time Burgess-Dunne automatically stable airplane taking off. The wings were swept back by about 90 degrees so that this side view appears as if the wings ran along the length of the plane. The engine is seen at the rear center.

By the use of this extreme sweepback, variable incidence and camber as well as suitably arranged fins, this ship was nearly automatically stable, but like most inherently stable ships, was very difficult to maneuver because of this very fact.

Here's the Grandaddy of the Blimp

WAY back in the good old days, approximating the year 1900, many of the venturesome of our land were playing around with what they called "airships", which in fact were child size blimps. Santos Dumont started the fashion in Paris and he was followed in this country by such personages as "Cap" Baldwin, Lincoln Beachey, Roy Knabenshue, et al.

And now we have a good view of Roy Knabenshue in full operation guiding his miniature dirigible which he exhibited all over the United States, spending one whole summer at the White City, Chicago, Ill.

This grandpa among blimps was not noted for holding its girlish figure during flight, but as shown in the photograph, was warped all out of shape by the vagrant breezes. This was before the day of the air-pressure ballonets now employed.

Suspended below the envelope was a lightly trussed nacelle which carried the engine on the front end, the rudder at the rear and the pilot at varying points along its length during flight.

Lacking vertical control surfaces, the dirigible was directed by Roy's weight as he raced back and forth along the nacelle to keep the ship in trim.

Now all this may sound funny to the present generation, but they should understand that it was only by such experiments that anything was learned.

Here's Roy Knabenshue hard at work with the baby blimp.

A Pretty Two Point Landing

FLYING 300 miles with the broken right wheel of his plane suspended in mid-air, reaching his station and successfully landing his plane without further damage or injury to himself was the distinctive experience of 2nd Lieut. James E. Darby, Air Reserve, Brooks Field, Texas.

Lieut. Darby had accomplished a cross-country mission to Graham, Texas, and was leaving the Graham airdrome for the return to Brooks Field, when the landing gear of his 0-19 plane struck a slight embankment. The right wheel was torn from the plane and swung in mid-air underneath the left wheel.

Noting his plight Lieut. Darby hastily scribbled a note and threw it down to the airdrome personnel, who immediately informed Brooks Field by phone. When the pilot arrived at Brooks Field he was met by two planes. On fuselages in box lettering, he read: "Either jump or land at your discretion." Lieut Darby elected to land, whereupon he accomplished, in the vernacular of the crew breathlessly watching, "one of the prettiest two-point landings ever accomplished at Brooks Field"—on the belly tank and tail wheel of his plane.

The young officer was highly commended by the Commanding Officer of Brooks Field, Major Frank D. Lackland, and by his fellow officers for his unusual feat, especially noteworthy, since Lieut. Darby is but a recent graduate of the Air Corps Advanced Flying School.

Plane Turns Ambulance

STANLEY BOYNTON, Rockland, Me., an 18-year-old aviator and holder of the Junior cross-country flight record, recently made two emergency flights, under very bad weather conditions. The first was to carry a woman from the island of Vinalhaven, Me., to Knox County (Me.) Hospital. He immediately returned to the island and brought Frederic Burns to the hospital for an emergency operation for appendicitis.

Boynton is flying for the Maine Air Transport Co. The company recently had an unfortunate and uncommon accident. It's first seaplane caught fire, and was burned by a spark that jumped from the storage battery while it was being charged.

Depression Not Seen in Air Travel

AMERICA'S leadership in commercial aviation is emphasized in an announcement that one airline carried 10,700 revenue passengers during July.

This showed an increase of 130 per cent in passenger taffic during the first half of the present year over the corresponding period of 1931.

A Cruise With the Blimp "Volunteer"

by V. L. SMITH and HUGH ALLEN

Navigating a sick blimp cross-country with air-diluted gas and limping engines is no picnic!

WHEN they have put your ship away for the night, have checked over the motors, written up the log and are sitting around the hangar waiting for the ten o'clock weather map to come over, flying men get to talking about a lot of things.

We do that too in lighter-than-air, but our talk that night in Los Angeles had struck a serious note.

People speak of the "Volunteer" as a small ship, a baby blimp, mentally comparing it with the Graf Zeppelin or the Navy dirigible Akron. But it looked massive that night, silhouetted against the evening sky and framed by the arch of the doors, swaying a little with the wind. From where we sat it looked like a captive elephant.

It was a tired elephant, though. Leuders' report had started the talk.

"Purity standing now at 80," he had reported.

Eighty percent. That meant that instead of a gas bag full of buoyant helium, we had an 80 percent mixture of gas and air.

In three years flying up and down the Pacific Coast, through rain and sleet and hail and high winds, a lot of air had seeped in through the pores. And whatever you might say about the bracing air of Southern California, it is no good for lifting airships.

The engines, too, were about ready for replacement. Faithful they had been, but 4,600 hours, with only occasional top overhaul, is a lot of hours for any aircraft engine. Now, as against a rated top speed of 58 miles an hour—well, we recalled that time last fall when we started over the mountains for Phoenix and struck a wind in San Gorgonia Pass that just pushed us back into the valley again—with our motors wide open.

The good ship "Volunteer" that sailed the stormy skies on a record breaking trip.

"Seems all we need is a new bag, a couple of new engines, some fresh helium, and the old ship would be as good as new," said Walter Massie, co-pilot, as he wound up the conversation a bit sarcastically.

Well, a new bag, one-sixth larger was being built, new motors had been ordered and there was plenty of helium gas at Akron, 3,000 miles away.

WE GOT out our pencils. We could take the gas out, compress it into cylinders, ship it to Akron, have it purified and shipped back. We would need between 500 and 600 cylinders. Two freight cars would handle it. The ship would be laid up three weeks or longer, depending on the railroads.

"Why not fly the ship back to Akron, purify the gas, put the new cover on, install the new engines and fly back under our own power?" someone said. After that there was a curious poring over maps and checking of mountain altitudes and finally we sent a wire in, asking permission.

Junior Pilot Hill, who was by way of being the meteorologist of the outfit, contributed one suggestion.

"The prevailing winds across country run southwest to northeast which is just our course," he said. "We ought to get tail winds all the way."

Prevailing winds! We were to recall that remark of Hill's many times during the trip. Though the wind blows out of the southwest most of the year, that doesn't mean that it blows in that direction every day. We got our first tail wind at Terre Haute, Indiana.

So we made our plans with great care. We were proud of our ship. It had never had an accident, never even broken a propeller nor washed out a landing gear. We went over the ship from bow to stern, just as an ocean vessel is gone over for an unusual voyage. Instead of caulking our seams, however, we paraffined them, to make them gas-tight.

Blimp routes are not as well established as those of surface ships. We studied the course carefully. Where steamship captains study the depths of strategic channels, we studied the

Showing the route followed by the "Volunteer" on its momentous voyage from the coast to Akron, Ohio.

heights of strategic passes through the mountains.

Full rigid ships, such as the Akron, can fly over most mountains that they would be likely to encounter. Rigid airships have flown at an altitude of 24,000 feet. We wanted to keep under elevations of 5,000 feet. The reason had nothing to do with the power of the motors but with the fact that gas expands with heat and with altitude. It contracts with cold and with the higher air pressures of sea level.

Consequently, every non-rigid airship has a small bag or "ballonet" inside it, something like the yolk of an egg. This is filled with air. As the airship climbs, the gas expands and forces air out. As it descends, or the temperature drops, the pilot forces more air into the ballonet from the slipstream of the propellers to keep the bag taut.

Back of each propeller is a little air scoop like a piece of stovepipe, with a damper like a stovepipe. When the damper is open and the propellers are turning, the air is forced in until the ballonet is full. When the helium gas expands, it simply forces air out instead of the gas overflowing and being wasted.

We took an ordinary vacuum sweeper along to keep up the air pressure at night when the engines were not running. But during the trip there were times when there was no electric light receptacle at hand to plug into and run the vacuum cleaner; so someone would have to sit in the car and watch the pressure gauge, and as the air grew cool and the gas contracted, he'd start the engines and force more air into the ballonet.

WHEN the blimp climbs, it continues to squeeze air out of the ballonet until finally the inner bag is flat and any further expansion of gas means a loss of helium. That point is called the "pressure-height" of the airship or its ceiling. You could go still higher if you didn't mind losing helium—or you could start with less helium and more air; but in either case the lift is cut down.

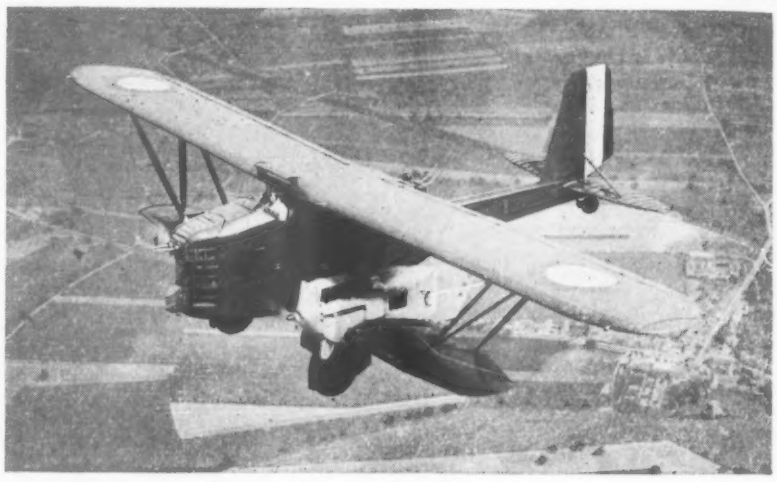
We wanted to carry at least 50 gallons of gas at all times, giving us a cruising range of 250 miles. It might be a long way between filling stations. Consequently we set our absolute ceiling at 6,000 feet and hoped not to fly much over 5,000.

Looking over the map, it looked easy. Sixty miles west of Los Angeles is San Gorgonia Pass, a slender knife blade set down between two great mountains, each more than 10,000 feet high, guarding the ranges of the San Bernardino and San Jacinto Mountains. The pass itself was only 2,600 feet high, and we had gone through it twice. The only trick was to go through with a westerly wind.

Once past the main body of the mountains, we could cross the desert to El Paso, come out on the broad slopes

(*Continued on page* 329)

The Latest Heavy Breguet 411 Bomber



The Breguet Bomber (411), in flight, showing the characteristic Breguet type of fuselage.

ANW one familiar with the old wartime Breguet will note a certain resemblance between that old ship and the brand new production, the "411," pictured above. It bears the characteristic Breguet touch in the design.

From the conventional design, however, it has evolved from the old biplane to a sesquiplane with the use of "N" struts inclined toward the center and with the wing engines streamlined into the lower half-plane as is shown.

This engine mounting is quite an ingenious solution of wing mounting twin engines on a biplane which has always been a somewhat troublesome problem in the past.

Projecting out of the front end of the nose will be seen the muzzles of the forward guns, while just aft of the trailing edge of the wing are the two rear turret guns.

Avro Builds a New Mailplane

THIS new Avro mail plane is worth studying as a late British commercial production.

At first glance, the engine mounting calls for attention which is rather out of line with present British practice, judging from what we have seen of late ships.

From the side view, below, it would seem that every attempt has been made toward attaining inherent fore-and-aft stability by the arrangement of the biplane group. The group has stagger, the chord of the lower wing is narrower than that of the top, and apparently, decalage has been applied.

Pants, or "spats" as they are known in England are quite appropriate to this fast flying ship although rather unusual in a commercial airplane of this type.

While this type of mailplane, which rather reminds one of the old Boeings, is being rapidly displaced by cabin type planes, yet we must not forget that conditions are different in England and what is practical here does not always apply to conditions abroad.

For one thing, the average distances covered are very much shorter than over here, and again, the English climate is milder—particularly in winter—so that protection is not so necessary for the pilot.

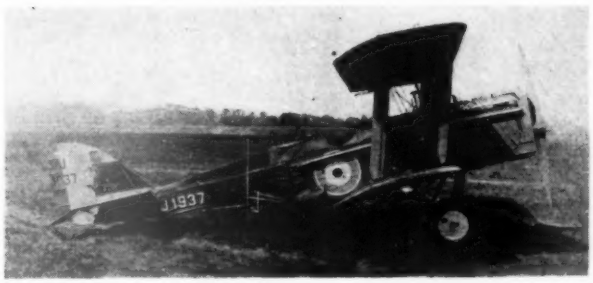
The new Avro Mailplane maintains British tradition by being a biplane. Note the neck mounting of the engine.

Our Warplane Photo Phanatics Club

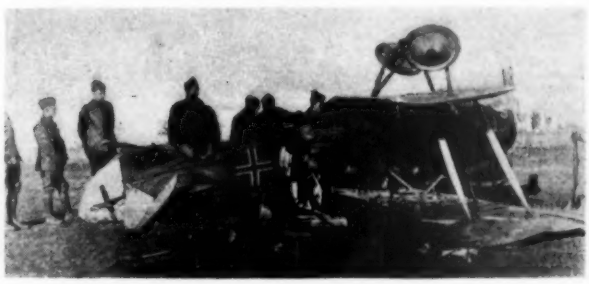
POPULAR AVIATION contributes four more warplane photos to the collection

A Pfalz D3A captured by the British.

A German Avintik CL11.



A British DeHavilland (DH).



This is a pancaked Roland D6.

THERE is a marked increase in the activities among our photo phans and the pile of letters is steadily increasing. We are receiving more names for membership and still more photos are being submitted to us for publication. This is mighty fine and we are much encouraged.

Now, our offer of $1.50 for each photo published still stands and we are willing to pay that amount to any of our readers who will send in a photograph suitable for running in P. A. However, we wish to impress two very important facts upon you before you send in your contribution.

1. The entry must be an original photograph and not a clipping from a magazine or newspaper.

2. Your name, address and subject of the photograph must be clearly written on the back of each photograph.

3. The photograph must not bear the name of any photo service agency nor the word "copyright".

Outside of these three conditions, the world is yours. Send any sort of an aeronautical photograph that you may elect, either of modern or wartime aircraft.

We have had a great deal of trouble during the past month with unsigned photographs. Our contributors will persist in sending in photos without giving their name or address, and this leads to unlimited confusion. It is not sufficient to send a letter with the photos—your name and address must be on the photographs themselves.

And now we will welcome the new members of the club and read what they have to say about their collections.

* * *

William Harris, Baltimore, Md., has a collection of 2,750 pictures. Out of this big collection he wishes to sell or trade 507 clippings from magazines made during the year 1926 up to and including 1932. The pictures are clipped and trimmed but not mounted. He will give free, to anyone buying this collection, a set of plans of the Consolidated Speedster, Model 20, published by the Consolidated Aircraft Company. Better get in touch with Mr. Harris.

* * *

P. H. Hebert, Photo Section, Kelly Field, Texas, has about 30 negatives of U. S. Army Air Corps planes, including all of the new planes. These photos, 3½"x5", are of excellent quality and will be sold to any club member at ten cents each or 12 for one dollar. Mr. Hebert enclosed several samples with his letter, and, as he says, they are excellent photos. Here's a chance to build up your modern plane section at a low cost.

* * *

William E. Sheaffer, P. O. Box 1, Chambersburg, Pa., says that he is just a beginner in the noble art of photo collection and has only a few photos. He wishes to improve his collection by trading, and says that he has some dandy commercial plane photos which he will swap for any type of good clear pictures. He would also like to have photos of model planes for which he will swap photos of his models. This is a new idea—this model photo exchange, and it should go over in a big way with our model builders.

* * *

George Loudermilk, 2645 North Shore Ave., Chicago, Ill., is not only interested in collecting wartime aircraft photographs but is extending his collection to wartime aviation books and magazines. He has some to sell and would be interested in hearing from other magazine and book collectors.

* * *

Gordon A. Nesbit, 1722 Central Ave., Anderson, Ind., is an enthusiastic collector, and wishes to get photos and specifications of the Friedrichshafen single-seater, and the Kondor E-111-A, both of them being German wartime ships.

* * *

Jack Groener, 41 Western Parkway, Irvington, N. J., is willing to give two airplane magazines for photos or snapshots of wartime or modern military or racing planes. He will also take photos of war aces. Whaddye say?

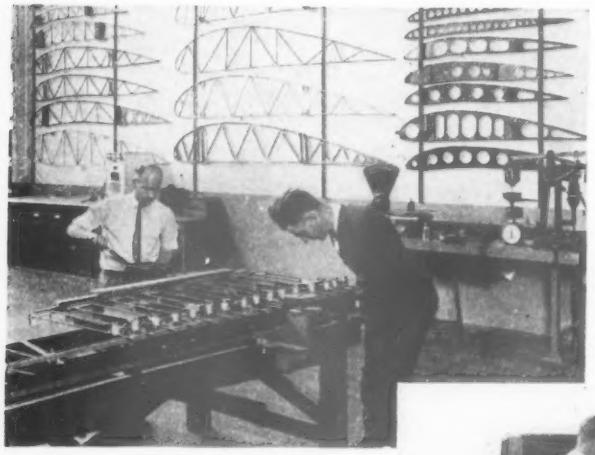
* * *

Peter V. Dobbins, 139 Elm Ave., Rahway, N. J., wants to know how to start a photo collection. Well, it's up to you fellows to initiate him.

* * *

Fred Bamberger, 817 West End Ave., New York, N. Y., says that he has a large collection of photos and wishes to enter into trades with the club members. He specializes in U. S. military types, but also has a great many racing and commercial plane photos. He says further that all the photos are clear.

How Army Planes are



At left—Making a loading test on wing ribs to determine their strength and carrying capacity, an important test.

Below — Making a microscopic study of airplane materials to determine their characteristics, such as strength, structure and composition.

by

WALTER E. BURTON

Aeronautical Engineer

IF UNCLE SAM treated prospective airplane pilots in the same manner that he tests sample army planes, he would have candidates constructed according to certain general specification, take each sample apart, and individually test the muscles, heart, skeleton and other units down to the last cell.

Then he would have another sample made and test it for quick-wittedness, endurance and other properties before finally accepting that particular model. Even then, he probably would find a number of faults that required correcting.

Although many would-be pilots who fail to pass the physical examinations necessary for admission to the service return home with the impression that something like this does happen, the fact is that a plane which is an applicant for an honored place among Army fighting equipment receives far more exhaustive testing than any human candidate. Once a plane is standardized, dozens or thousands of others like it can be made—a condition that does not apply to pilots.

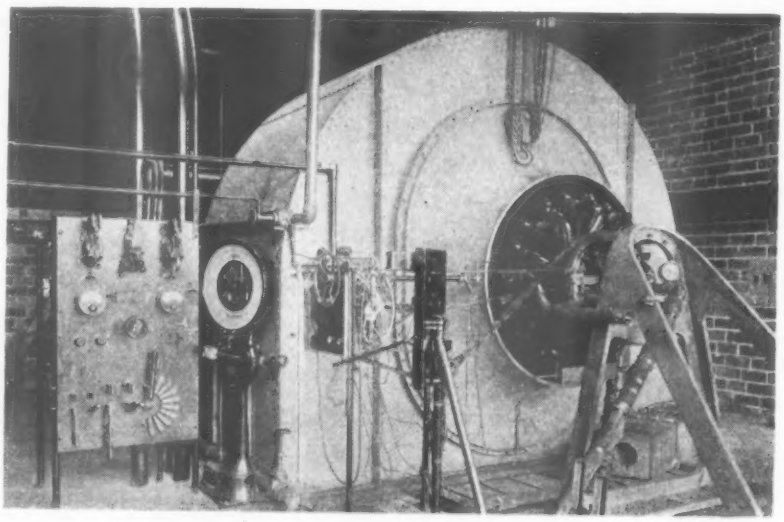
It takes at least two years for a new type of army plane to grow up, counting from the time the first basic plan is formed, to the date of standardization and the center of its development is the $10,000,000 Army Air Corps plant at Wright Field, Dayton, Ohio. This investment is represented almost wholly by machinery and equipment that makes Wright Field the most comprehensive experimental establishment of its kind in the world. Highly-trained army officers, assisted by civilian experts in various branches of engineering and science, work together to evolve better fighting planes.

These men get together from time to time and prepare, on paper, general plans for new kinds of airplanes and engines. The plans, known as "general specifications", are given to manufacturers of commercial aircraft. These manufacturers prepare tentative designs and specifications for the planes or engines and turn them over to the engineers at Wright Field. The designs are, in rare instances, accepted outright; sometimes rejected, but more often are sent back to the manufacturer for certain changes.

After this preliminary "paper work" has been performed satisfactorily, the manufacturer proceeds to build the first experimental model of the new ship. In letting contracts for planes, engines and equipment, the Materiel Division of the Army Air Corps tries to distribute the work as uniformly as possible among established manufacturers. In fact, the situation is one of mutual interest. The development of better aircraft and engines depends largely on military aviation, while on the other hand, the Air Corps depends on manufacturers to carry out the actual development work on these items.

The manufacturer submits to the Wright Field engineers, a stripped sample of the new plane; that is, a ship that has wings, landing gear, fuselage, control surfaces, and other essential parts involved in the fundamental design, but which is minus such articles as safety belts, instruments, etc., which can be added after all of the "bugs" have been ironed out of the craft itself.

First the stripped model is "X-rayed". This does not mean that it is placed in a giant X-ray machine, but that a small army of experts is turned



Propeller testing stand with casing over propeller.

Built for Uncle Sam

EVERY possible precaution is taken in the design and construction of Army planes. Here we have an interesting story of the strenuous tests made on the structural parts and finished planes at Wilbur Wright Field. This article was carefully checked and approved by the Army Air Corps, Materiel Division, who also provided the photographs used.

loose on it. These specialists are divided into groups. A half-dozen engineers may turn their attentions wholly to the landing gear. They study the design of the wheels, brakes, struts, and shock absorbers. Almost always they find things that can be changed. Perhaps a strut can be moved an inch to produce a stronger member. It may be that the mechanism for lowering and raising a retractable gear looks as if it would stick when the wheels are muddy.

While the landing gear section is in action, other groups are going about with figurative chips on their shoulders, looking for trouble in the wings, the fuselage, the tail group or other major parts of the ship.

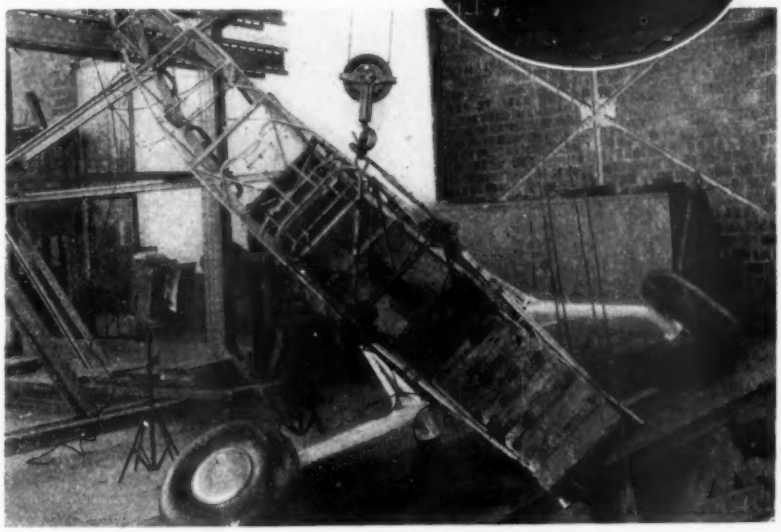
FINALLY, the "X-ray Squad" summarizes its findings in a report that usually recommends a number of changes. But perhaps some of the specialists are not as certain as they might be about the advantages to be gained by changing the structure. They know, however, that any doubt probably will be removed by the next step in the plane's physical examination. This step consists of taking the ship to pieces, and testing the principal parts to destruction.

The wings are removed and taken to one of the buildings where a huge testing rig is set up. Engineers place a wing in this machine, resting it on jacks so that it is supported uniformly. Each wing is secured in the same relative way that it is fastened to a ship fuselage. Electrical instruments that register the extent of stress are installed at all vital points in the wing.

Then weights—bags of shot and bars of lead—are piled on the wing, the jacks are eased down and the instruments are read. More weights are added until something lets go. That is the end of the test and often of the wing too. It is an exceptionally good wing structure that does not reveal some weakness on this torture rack.

While the wing is being tested, perhaps the fuselage is receiving severe treatment not far away. If it is of the monocoque type, that is, built something like an eggshell, engineers are curious to know what would happen if the plane dived into the ground. So they place the fuselage on its nose in a press, and apply force on the tail end until some part fails . . . very much like the cracking of a pecan nut by squeezing it endwise in a nut cracker.

The landing assembly, although one of the most useless parts of an airplane in flight, becomes vitally important when the ship lands or takes off. Everything must be as perfect as engineers know how to make it. So the landing gear of the sample plane



Below—Testing a landing gear with a loaded dummy fuselage by dropping it a given distance. Above—The landing gear after a test to destruction.

is mounted on a test fuselage which is loaded with weights. Then the whole assembly is dropped from a known height so that the wheels strike a concrete block. The height is increased bit by bit until some part of the landing gear breaks. Sometimes it is a welded joint, sometimes a wheel or other part.

The engine, if it is not of already standardized design, has been taken meanwhile to the power plant laboratory. In this building are numerous engine-testing rooms. Incidentally, this is the second noisiest place at Wright Field, the first being the propeller-testing unit.

A visitor to one of the engine rooms finds a group of men huddled in a glass-walled chamber intently watching a maze of instruments. These instruments—gauges for indicating fuel consumption, scales for measuring oil consumption, torque scales, revolution counters (tachometers), temperature and pressure gauges—are connected to the engine that is pounding away with a deafening roar a few feet away, on the other side of the glass.

The engine fairly bristles with tubes and wires, for the instruments are attached to all vital points. A mechanic is making some adjustment, his hair standing straight out in the air-stream that cools the cylinders. The engine power is being used to drive a fan that takes the place of the regular propeller and a dynamo whose output can be measured. The engine is run day and night until it is worn out. Then it is studied to determine just why it gave up the ghost.

PERHAPS, the Air Corps specialists want to know how the power-plant will behave six miles above the earth, with the temperature fifty below zero. They take it to an altitude chamber where the temperature and pressure can be controlled to simulate any condition likely to be encountered in actual flying. A new $100,000 installation makes it possible to operate 1,500-horsepower engines under approximate conditions ranging from summer temperature to 55 degrees below zero, Fahrenheit. Such an engine, incidentally, has to be provided with 185

pounds of air a minute. The walls of the new altitude chamber are insulated with eight inches of cork.

While the engine is giving up its secrets, the propeller is being whirled to pieces on an outdoor test stand. This outdoor stand will be indoors as soon as engineers have completed a study of sound-insulating methods, preliminary to building a sound-proof shed over the propeller section. The reason for this shed is that the noise produced by a propeller whirling at perhaps 4,000 r.p.m. can be heard a dozen miles away, if the wind is right.

Furthermore, propeller testing is carried on at night, from early evening until nearly midnight. If it were not, no other departments at Wright Field could function because of the penetrating sound. But this night testing has caused persons who live in the vicinity of the field to object. They cannot sleep, they say; so the sound-proof shed, expected to keep the noise at home, is being built.

Looking remotely like emplacements for a strange kind of cannon, the trio of propeller-testing stands extends back from the main group of buildings. Overhead is a 40-ton electric crane for handling electrical equipment and propellers. At the time of writing, installation of all three units had not been completed.

When this is done, each of the stands will support a 6,000-horsepower electric motor capable of swinging a 40-foot propeller, with 5 feet ground clearance, at speeds ranging from 720 to 4300 r.p.m. The motors are arranged so that the propeller stream of one can be directed on the next stand, to reduce the tremendous power load of a propeller that is being given centrifugal tests under conditions comparable to those produced by a steep dive.

Because propellers break now and then, all recording instruments are housed in concrete vaults beneath the stands and an underground tunnel connects these vaults with the laboratory building containing accessory equipment. Also, the immediate vicinity of the testing stands is kept clear of other buildings and equipment.

These major tests of the sample plane units, coupled with studies of smaller parts such as fabric, wires, struts, spars and tubular frame members, reveal to the corps of specialists analyzing the ship that it can be improved by making changes here and there; or else that it is so hopeless that further efforts at making it perfect would be a waste of time and money.

If the airplane looks promising, the manufacturer is informed of the changes thought advisable and he proceeds to build a complete plane. This, like the first stripped model, is turned over to the X-ray group for study. Perhaps more changes are advised, and further static tests carried on to remove any doubt that might remain.

FINALLY, after the new plane seems to be about as perfect as it can be made through the application of knowledge gained by past experience, it is turned over to the flight-test section. Expert pilots take the ship up, fly it wide open over a speed course so low that the wheels seem to scrape the ground; put it through various climbing tests, from the saw-tooth climb to the vertical "hanging-on-the-prop" variety; determine how it handles in various dives and spins and otherwise give it a severe third degree.

Each pilot turns in his report, incorporating his opinions on the ship in general, and perhaps suggesting a few changes. An experimental plane may remain in the test-flight classification for months. Whenever a pilot has a flying mission to perform, he takes up a ship whose flight pedigree is not very long, thereby adding to its hours of practical performance.

At last, two years or so after someone or some group conceived a new type of fighting plane, the world learns that Uncle Sam has a ship that is believed superior to anything of its kind ever put into service in this country or elsewhere. Thereafter, standard ships of the new type are produced in quantity as needed, for assignment to duty wherever the army maintains an air fighting unit.

(*Continued on page* 327)

Army Air Corps test pilots all ready for trying out new planes—a hazardous job.

An Early Fairchild

Here's the front end of the Fairchild.

FAIRCHILD, one of the present day leaders in airplane construction, like the others, had to start at the beginning in the old days. Here we have a view of one of the early Fairchilds built in 1911 and equipped with an Emerson two-cycle engine.

We can't recall whether it was the engine that handicapped the plane or whether it was the plane that handicapped the engine—but it was one of the two, anyway.

As was other planes of that era, a good set of skids and a large number of wheels were necessary for negotiating the rough cow pastures that then paraded under the name of "airdromes". It is interesting to note that the tire is missing from the fourth wheel from the right. Wonder where it went to?

Takes Off Over Waterfall

AN INTERESTING feat was accomplished on a small lake near Prince Albert, Northern Saskatchewan. The pilot was Bill Jewett, pilot-geologist of the Consolidated Mining & Smelting company, and Jim Fox was his mechanic. They were forced down on this lake near Coppermine river, and an inspection showed a hole in one of the engine's pistons.

Jewett was at a loss as to how he could repair the damage, but finally he and Fox hit upon the plan of using native copper which was deposited along the lakeshore. This served as a partial repair, and the motor was started. The plane got under way and made good speed, but not enough to get the craft into the air.

The pilot noted a spot where the lake appeared to narrow and the current flowed much swifter. Inspection showed a 400-foot waterfall there. Below was a ravine, studded with rocks and rugged trees.

He taxied back a way, pointed the nose of his ship at the waterfall and gave her the gun. The plane went over the edge, surged downward sickeningly for a moment, then righted itself and began to climb slowly. The men reached their base, 300 miles away, four hours later.

Jumping Them Off the Grass

by P. A. TECHNICAL STAFF

How the entries in the recent European contests were tested for quick take-offs and how the ships performed.

SOME highly interesting and educational results were had in the recent European contests, most of the events tending toward utility and safety rather than toward brute speed as is the present fad in the United States.

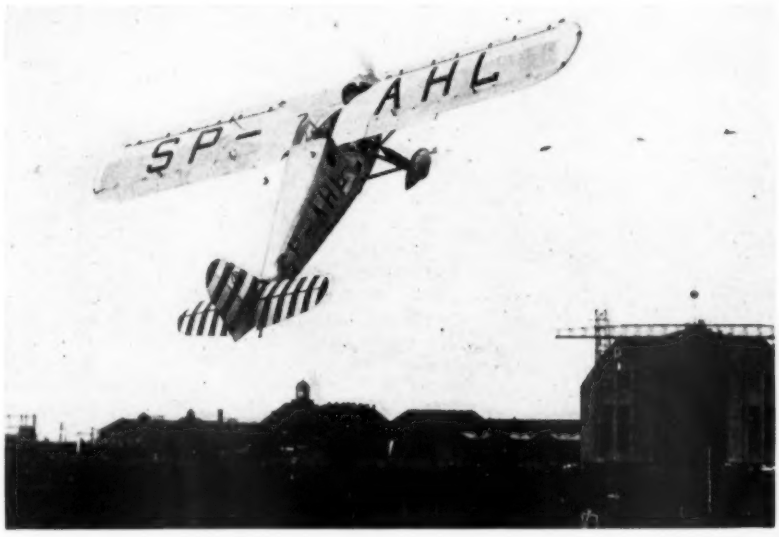
Speed contests there were, but they were far from being the most important events on the program. Practical everyday flying features predominated over mere sporting events, and according to the writer's idea, this will be the ultimate conclusion in coming exhibitions.

Of all the contests that were held in the "Europaflug", adopting its German title, the quick take-off contests were the most interesting and of the greatest importance. The photographs of these startling take-offs will attract the American reader, most of them being steep enough to make an Autogiro hide its head in shame. They are reminiscent of the McDonald "Doodlebug" which opened the eyes of the spectators during the 1930 meeting at Chicago.

Prominent among the machines entered at the meet, were the distinctive Heinkel low-wing monoplanes that were seen everywhere. This is a trim neat looking job having wonderful performance and is equipped with an inverted "in-line" air-cooled engine of English manufacture.

Then there was the Klemm low-wing ship which put up an excellent performance and the Polish "PZL", equipped with an English "Gypsy" air-cooled engine.

And now back to the subject of the startlingly steep take-offs and related performance. As will be seen from the accompanying illustrations, these ships were provided with wing-slots and compensating ailerons at the trailing edge. The maintenance of the full lifting value at high angles of attack and an unbroken air-stream over the top of the wing are indispensable in such performance and are attained by the slots and compensating ailerons. Many of the take-offs were at angles in excess of 45 degrees and in no case was the horsepower greater than that commonly installed with this type of airplane.



Here's a Polish ship (PZL) zooming right off the ground at a terrific angle. Here is a graphic illustration of the effectiveness of wing slots.

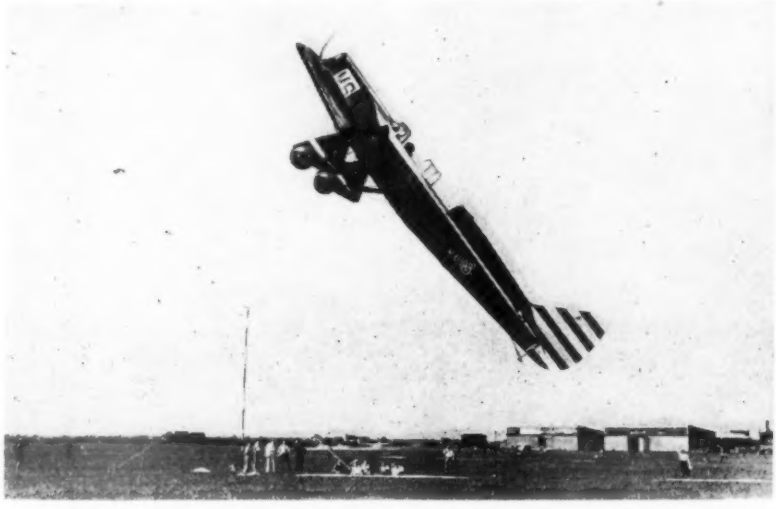
This ability of quick climb, low speed landing and almost vertical descent in light winds, are the most desirable attributes of a modern plane, and that this virtue is coming into its own is clearly portrayed by the photographs. Contests, in which such features form the objective, are really constructive and useful contests where the spectacular is eliminated in favor of utility.

So much has been presented on the subject of wing slots in past issues of POPULAR AVIATION that it is not considered necessary to enter into a further detailed discussion at this point, but for the benefit of the newcomers who have not read these articles we will give a brief review.

With a common plain wing, the lift increases with an increase in the angle of attack up to approximately an angle of 15 degrees. When the angle is increased beyond this critical angle of "burble point", the lift drops off suddenly due to the air-stream breaking up over the top surface of the wing. Under such sudden diminuations in the lift, the ship will "stall."

By the employment of air guide vanes, commonly known as "wing slots", at the leading edge of the wing, the air-stream is so controlled in its flow over the top surface of the wing that it follows along the wing contour even at angles greatly in excess of 15 degrees, and by this means the lift is maintained at the steep gliding angles shown by the photographs.

Now, with the lift increased by this method, it is evident that a sufficient lift can be obtained at a lower speed than with a plain wing or airfoil.



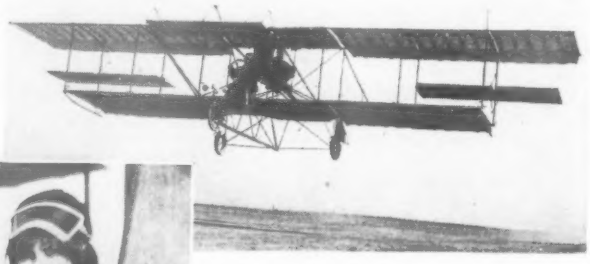
This Heinkel sure does takeoff—we can't deny it. The angle exceeds 45 degrees.

XUM

Blanche Scott—Early Aviatrix

Right, Miss Scott taking off in her early Curtiss Pusher type. Note the floating ailerons.

Below. What the well-dressed aviatrix wore during the season of 1910.



BLANCHE SCOTT was one of the earliest American birdwomen, or "aviatrices" as they were then known. In her time, she was a headliner and a contemporary of Ruth Law.

Sitting way out on the front porch of these planes and subjected to the full blast of gales blowing some 60 m.p.h., it required secure heavy clothing of the type she is shown wearing, to avoid giving a Lady Godiva act. The pilots of today, snugly cuddling up in the protection of the cockpit, do not fully realize how very rude the windstream can be—way out in front.

You will note that Miss Scott used the old Curtiss Shoulder Control system. Moving the arms of her chair back and forth with her shoulders moved the ailerons. Pushing the wheel forward put the elevators "down," pulling the wheel back, caused the ship to climb.

And as you will note, floating type ailerons are nothing new, although they were loudly heralded as an innovation about a year ago at the Guggenheim contests. They were quite effective at the low speeds of these old ships—much more than when the ailerons were retired to the trailing edges.

A Close-up of A Sailplane

HERE we have a sailplane of an advanced type, just taking off at a German soaring contest. It shows the greatest care in the matter of streamlining and in the reduction of head resistance.

This photograph is published in answer to a number of requests received recently for a close-up view of an advanced soaring plane, and will be followed by more pictures of sailplanes taken during the 1932 soaring contests in Germany.

Just off, with the glider launching cable still attached. Note the air-speed pitot tube in front of the pilot.

Biggest Blimp Nears Completion

THE largest non-rigid airship in the United States, now under construction by the Goodyear-Zeppelin Corporation, and to be used by the Army Air Corps for coastal patrol work, is soon expected to be completed and ready for trial flights.

This airship, known as the TC-13, will have an overall length of 233 feet, a diameter of 54 feet and a height including the airship car carried underneath of 69 feet. It will have a gas capacity of 360,000 cubic feet with a gross lift of 22,300 pounds. Its lifting power will be non-inflammable helium gas and it is designed to carry from 900 to 1,300 gallons of fuel, depending on the length of the cruise.

Its cruising range will vary according to the speed. For instance, it will cover a total of 1,000 miles at a speed of 65 miles per hour, 1,800 miles at 50 miles per hour and it can remain in the air about 100 hours at a speed of 25 miles per hour. A noteworthy feature of this big airship will be its ability to pick up fuel during flight.

At present the largest non-rigid airships operated by the Army are approximately 200 feet long, with a gas capacity of 200,000 cubic feet.

The airship car in the TC-13 is to be internally suspended flush with the envelope, its supporting cables dropping from the top of the inside of the gas compartment of the envelope. Two air balloonets will be installed in the envelope for trim and expansion. The present type airships have the car suspended below the bag with cables supporting it attached to the exterior of the envelope.

On each side of the car, at the center, will be installed two engines of 375 horsepower, each of which will be geared at a ratio of three to two for three-bladed propellers, the motors turning three times to two turns of the propeller, thus reducing the speed of the propellers and causing less noise.

The car will be of welded tubular construction, enclosed. The covering will be corrugated metal and fabric. There will be space for three pilots, two mechanics, a navigator, radio operator and bomber, with sleeping accommodations, toilet facilities for the crew, a compartment for bombs, a sub-cloud car and an extra-strong radio set with a range of 3,000 miles. The tanks for fuel, water and storage will be overhead. These tanks, in the event of trouble, can be dropped by the pilot at his discretion, thus providing greater buoyancy.

The sub-cloud car, originally designed in this country by the Air Corps, is an improved model of the first car, its advantage lying in the fact that the ship may hide above the clouds, while an observer in the car below the clouds can observe actions on the ground and report by telephone to the ship. A single cable will support the sub-cloud car about 1,000 feet below the ship.

Timing Aircraft Performance

by RENE LEONHARDT
Aeronautical Engineer, Berlin, Germany

Improved German apparatus for precisely timing events in aircraft performance, more accurately than possible with a stop-watch.

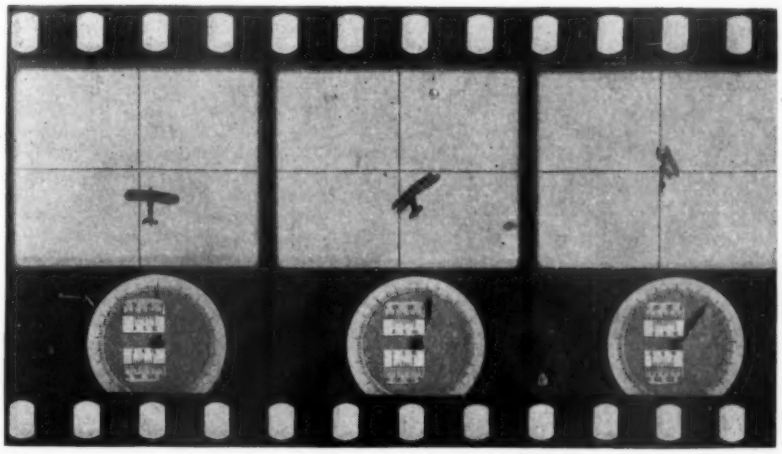
THE cinema camera is not only of use for artistic purposes; it has of late years also been placed in the service of science and technology. Films have been made of cosmetic and surgical operations. They have been taken by expeditions and it has been possible to reach important decisions regarding the rationalizing and improvement of manufacturing processes by means of the film camera.

Finally, studies have been made of every kind of sport with the aid of the film, particularly by slow motion pictures and the action of runners, bicycle and motor racers have been permanently recorded in this way.

The photographic lens has also taken the place of the human eye in aviation and has been of great value both when used from aircraft and from the earth for purposes of military reconnaissance and surveying. Aero photography also plays a considerable part in quite a number of important undertakings, and until recently, to a limited degree in connection with the operation of safety devices such as parachutes, etc.

We know, for example, that in the domain of mechanical transport by water or on terra firma that "capacity" is not only tested by workshop trials and by constructional calculations, but also by means of practical experiments.

The machine is tried out upon a known road by the aid of the physical principle and one is able to judge the average capacity by short approximate calculations and thus ascertain the speed on the graphical curves. It is possible to determine the ease of turning and other conditions of travel.



A strip of the film on which the position and timing of an airplane are accurately recorded.

If we look for something of this kind in aviation, we shall find that there is nothing similar to the above. We shall be obliged to recognize that we have, up to the present, been entirely dependent upon the use of the ordinary instruments carried in the plane, such as the air-speed meter, climbing and drift indicator and other well known instruments. The readings of the pilot or the observer who accompanies him, taken from these instruments is then all we have to depend upon.

If we remember that the final results depend on the adjustment of the instruments, the objectivity of the observer, and other outside influences and mistakes which can only be checked with difficulty or not at all, we shall be obliged to admit a deficiency. This is the impossibility of obtaining practical data concerning the capacity of aircraft regarding its speed, climbing, landing and turning ability and as to its behavior in various air currents, etc.

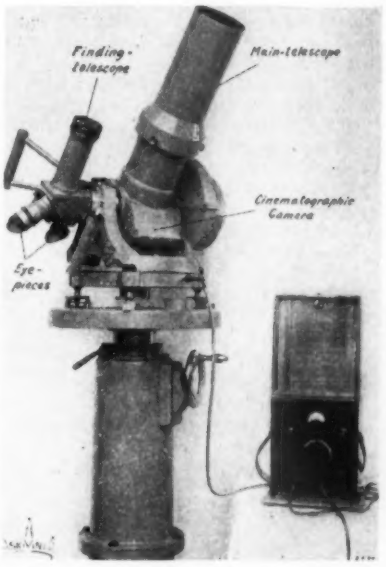
It is perfectly clear that the instruments, which are carried on board, are not to be compared to those used on land or water. It will be quite obvious why it is not possible, by the crossing of a certain territory, to arrive at conclusions as to the capacity of an airplane. It is impossible to mark a definite route of space and the slightest divergence from the vertical, or from the horizontal, would considerably falsify the result of the measurements.

The process of building up rules and formulae, and attempts to adapt airplane structures to stratospheric conditions, caused a continual striving towards new methods for the exact determination of the capacity of aircraft.

The first important progress was made by bringing the film into use or rather a theodolite which at first recorded photographically, but later on cinematographically. The latter apparatus was constructed by Dr. Herbert Fuss, of Neubabelsberg near Potsdam Observatory.

There have been early attempts to exploit the film camera for the above purposes, but the ordinary instruments have always proved inadequate for such special uses as they only permitted the comparative position of the airplane in

The cinematic theodolite in detail showing its principal parts.



Taking an observation with the cinematic-theodolite.

the space to be registered but not the marking of the exact route. The marking of time observations were not free of mistakes of a subjective nature.

Hence came the idea of using a theodolite, just as it is used for wind measurements by means of pilot balloons. This idea was developed by Doctor Fuss of Neubabelsberg during the war in the years 1915-1916 when the exact determination of the capacity of an airplane became especially urgent.

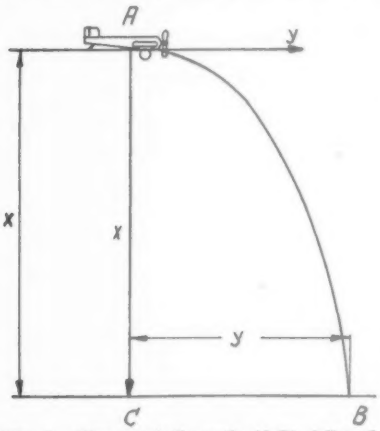


Fig. 1. The parabolic path (A-B) followed by a falling bomb.

When it was recognized that the fighting value of an airplane depended on its speed and the technique of bomb-throwing began to be studied, it was brought into practical form. Especially, the two last questions the solving of which had been exceedingly problematical and to a considerable extent a matter of chance.

Fig. 1 shows what occurs when a bomb is thrown from an airplane under the simplest flying conditions (straight, horizontal flight) from a height of 1000 meters (3280 feet) while travelling at a speed of 180 kilometers per hour (108 m.p.h.). On the one hand, the bomb has (at the moment of being dropped) the same speed and the same forward impulse as the airplane but on the other hand, it is subject to the law of gravity and must therefore describe a parabolic curve on its way to the earth.

The horizontal movement becomes less as the bomb falls lower until it is travelling in an almost vertical direction.

The theoretical parabolic curve is in reality affected by the air resistance to such an extent that the estimated distance absolutely does not correspond to the reality. Hence, we see that the distance between the perpendicular from the airplane to the earth, and the estimated point of arrival, will be considerably altered by the resistance of the air.

The latter fact in particular, the difficulty of determining the speed of the airplane and the study of the air currents, called for the employment of practical tests without which a certain aim appeared impossible. The practical attempts to determine the exact line of travel by means of a theodolite proved unsatisfactory.

The high speed of the airplane demands an exceedingly rapid succession of observations per unit of time. If we remember that for a speed of 180 kilometers per hour (108 m.p.h.) the average speed is about 50 meters per second (165 f.p.s.) and that even on a path of this length, considerable divergence from the normal course is possible, it is a matter of difficulty even for an experienced observer to make one observation per second.

A further difficulty, entailed by the use of the ordinary theodolite for the determination of the course, lies in the necessity of retaining the very rapidly moving object of the observation within the crossed wires of the telescope lens. If we bear in mind that the airplane is a great distance away, we shall see that such mistakes may result from even a slight divergence from the exact angle as to make the result of the measurements entirely worthless.

Messrs. Askania Werke A. G., Berlin-Friedenau, began, for these reasons, to use an impersonal and therefore more or less infallible mechanism in place of the human eye in order to be able to register the largest possible number of observations per time unit, with the greatest possible exactitude.

The use of one theodolite is sufficient for the surveying of fixed points, gauged to turn from various positions, but in order to fix the position of moving objects in space it is necessary to work simultaneously from at least three different points. The angles obtained by the observation of the different stations then make it possible to afterwards fix the position of observation in space by means of the point at which the several lines of sight converge.

The usual form of a theodolite station consists of three instruments, the simultaneous actions of which are caused by telegraphic electrical sparks from the control station.

Fig. 2 shows an instrument of this kind. The object of observations is focused through a telescope, or rather through the lenses, which are used according to the position of the telescope.

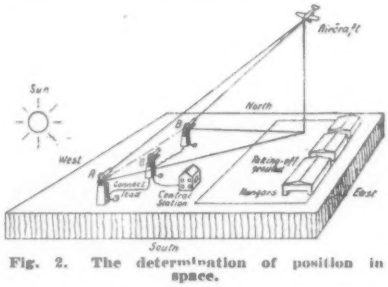


Fig. 2. The determination of position in space.

Parallel to this, the object in question is photographed. This is used for projecting the object, by means of an optical system (mirror-system) of great intensity and focal length, on the film in the instrument.

The exposure is made by means of a

(*Continued on page* 332)

A Flying Freight Train

Loading the Junkers air-freighter.

THREE tons of cargo can be carried 500 miles at a speed of 100 m.p.h. by this Junkers freight plane now put in use by the Canadian Airways, Ltd. It is to be used in northern Canada and it is claimed to be the largest freight plane in service.

Our photo shows the plane being loaded with large boxes through convenient doors cut in the side of the fuselage. From all appearances, these packing cases are large enough for holding a piano.

No Parachutes in Bolivia

THERE is at least one country in the world where parachutes are about as useful as snowshoes in the tropics. According to Lieut. A. Y. Smith, Air Corps, who recently returned from a tour of duty in Panama and who visited South America during a leave of absence, the Bolivian Air Force does not include the parachute as an item of individual equipment for its fliers.

As is well known, Bolivia is a very mountainous country. La Paz, the capital, is situated at an altitude of about 13,000 feet, and it may be said that this city, in point of altitude above sea level, is the highest in the world. The same holds true of its landing field. Due to the rarity of the atmosphere in this country, the rate of descent of a parachute is so fast that it is langerous to life or limb. Instances are known where Bolivian fliers suffered broken legs and other severe injuries after making parachute jumps.

As may be surmised, flying in Bolivia faces many handicaps. Because of the lack of density of the atmosphere, landing fields must, of necessity, cover large areas. Landings are fast, between 60 and 80 miles an hour, depending on the type of plane used. Take-offs are difficult and require a very long run before the plane finally takes the air

The Why and How of Bombing

by LIEUT. CHARLES H. HOWARD

Aerial bombing plays a vital part in a war, claims the author who recently read this article over the radio, and later published it in the Army Air Corps "News Letter."

THE STORY of civilization, through every race, is filled with symbols, drawings and writings indicative of man's age old ambition to fly, and we may be sure that along with any conception of flight came also the idea of dropping missiles on the heads of the enemy.

The earliest record of aerial warfare of this type is found in the Mahabarata in India, dated about 600 B. C., from which it is quoted that the enemies of Krishna "built an aerial chariot with sides of iron and clad with wings. The chariot was driven through the sky till it stood over Dwarkha, where Krishna's followers dwelt, and from there it hurled down upon the city missiles that destroyed everything on which they fell." But even though aerial bombardment has its beginning in ancient mythology, we must drop down some 2,500 years to find the first actual use of the airplane in the role of bomber.

From all accounts this occurred in 1911 during the Italian campaign in Tripoli. Apparently, the effects were largely moral, the material damage being slight. The next use of the aerial bomb was by the Spanish forces in the Moroccan campaign.

On August 30, 1914, with the enemy almost at the gates of Paris, a single German airplane appeared in the evening sky and loosed on the city a shower of small bombs, accompanied by a note saying—"People of Paris! Surrender! The Germans are at your gates! Tomorrow you will be ours!" The comparative damage done by note and bomb is not recorded. It is from this raid that aerial bombardment of the World War may be said to date.

The Germans early recognized the value of long distance bombing and proceeded with the organization of special bombardment units designed to attack the manufacturing cities along the English coast.

Aerial activity on the front constantly increased and all the belligerents kept up continuous raids on the front lines and on munition dumps and railroad yards immediately to the rear. From the scattering efforts of the first part of the war, in which one or half dozen airplanes participated, bombardment aviation, at the time of the Armistice, had developed into a major arm in which literally hundreds of airplanes carrying tons of bombs took their part.

Riley Scott about to test an early air-bomb. The bomb weighs 6 pounds.

AMERICA'S effort at bombardment began with a raid by the 96th Squadron the 12th of June, 1917. They were equipped with the French Breguet Bombers, American machines not yet having appeared on the front. It was after the St. Mihiel offensive that our First Bombardment Group was organized, and among the four squadrons forming it we find the 11th Squadron, now part of the 7th Bombardment Group and the First Bombardment Wing at March Field.

During the first years of the war, many and varied types of planes were employed as bombers. The same machine used in observation work was found in bombardment squadrons. The bomb load was necessarily limited to some hundreds of pounds; the carrying and releasing mechanisms were crude, the bombs in some cases having been heaved overboard.

Sighting devices had not been developed, and accuracy was largely a combination of the pilot's skill, luck and experience.

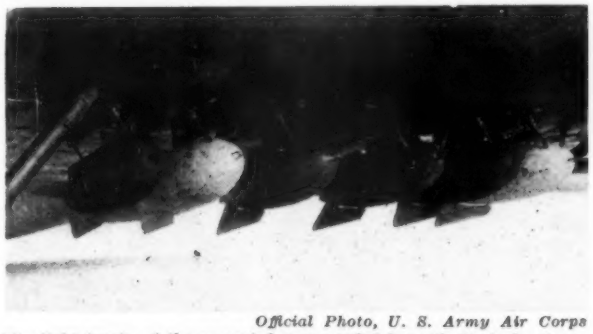
The year 1917 is marked by the appearance of the modern two-engined bomber of which the Handley-Page was the British version and the Gotha that of the Germans. Both these machines were capable of carrying nearly a ton of bombs, but, due to their huge size and slow speed, were used almost entirely at night.

As the war progressed, the value of bombardment aviation became increasingly apparent to the Allies to the extent that the British planned an increase in their air force from 86 squadrons, with ten for long distance bombardment, to 179 squadrons, of which 66 were to be for long distance bombardment. The plans of our own forces contemplated the formation of 101 bombing squadrons with 1,600 planes by July of 1919.

It is out of this crucible of the World War that modern bombardment aviation is molded. We say molded advisedly, for with the realization that practical aviation is scarcely more than a decade old it would be foolish, indeed, to crystallize one's ideas in the face of ever changing improvements. However, the experience of the years from 1914 to 1918 has given us some very definite ideas of what is desired.

We have, for convenience, divided our requirements into two general types called "light" and "heavy" bombers. The line of demarcation has been arbitrarily drawn at a load of eleven hundred pounds for the light, and two thousand pounds for the heavy bomber. It has been generally assumed that the light bomber would be a much faster plane and able to carry on its mission in daylight.

Recent developments give rise to the belief that we may have our heavy bombers equalling the speed of the other type and both approaching the speed of the present Pursuit plane. The study of the requirements of any airplane soon



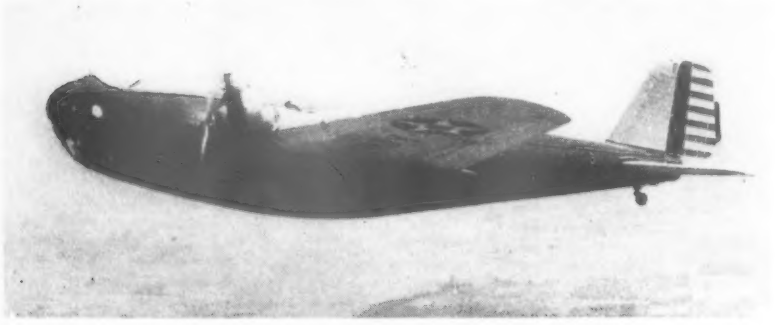
Official Photo, U. S. Army Air Corps

The light bombs of the present day suspended beneath the body of one of the latest army bombers.

convinces one that each design is a compromise among a number of desirable features.

Some of the essential elements of a good Bomber are: bomb carrying capacity; speed; radius of action and range; ceiling or operating altitude and rate of climb; defensive power; landing speed; maneuverability; field of view; ease of maintenance and reliability.

By bomb carrying capacity we mean not only the ability to lift the necessary weight but also such structural arrangement as will allow us to carry this weight either as one large bomb or several smaller ones. In the case of the light bomber, we should be able to distribute the load as one 1,100, two 600 or four 300-pound bombs. The need for this ability to carry various sized bombs arises from the variety of targets which it may be necessary to attack. It is useless to drop ten 100-pound bombs on a target that we know requires a direct hit from an 1,100-pound bomb. It is equally useless to drop 1,100 pounds in one lump when



One of the latest bombers in flight, the Martin XB-907.

greater damage can be done by a series of small explosions over a greater area.

Closely related to bomb carrying capacity is the radius of action and range. Modern conception of bombardment anticipates actions to a depth of some 300 to 400 miles in enemy territory or, in the case of the defense of our shores, an equal distance out to sea. It is unnecessary to point out that a plane making such a flight must be able to return to its base without landing. This imposes a severe penalty on load carrying due to the huge amount of fuel required.

SPEED! In this one word we have the essence of aircraft employment, whether commercial or military. Heretofore it has been necessary to make considerable sacrifice in this vital requirement in favor of carrying capacity. Two elements now dictate that more consideration be given this feature. They are, the high speeds developed by the modern Pursuit ship and the increasing accuracy of anti-aircraft fire.

With fighting planes making speeds up to 250 miles per hour, it is obvious that bombardment at 100-miles per hour cannot hope to perform its missions without tremendous losses. The increased problem for anti-aircraft resulting from high airplane speeds can be readily appreciated when it is known that a plane flying 100 miles per hour at an altitude of 15,000 feet travels some 1,800 feet forward while the shell travels to its target from the ground.

Under defensive power we find what is to the author one of the most fundamental requirements of a good Bombing plane. By defensive power we mean the provision of sufficient machine guns to withstand the attacks of pursuit airplanes. However, in considering this question we must think, not of a single airplane, but rather of from nine to thirty-six planes flying in formation. One of the greatest lessons of the World War was the effective mutual support achieved between Bombers when flown in close formation.

Another important attribute of the ship must be reliability. Not only from the expectancy of having it in service every day and able to complete each mission without mechanical or structural failure but from the standpoint of moral effect on the crew, who feel that no matter how tough the fight or dangerous the mission their ship will do its part. Absolute confidence in the airplane cannot be overestimated as a morale contributing factor.

Representative of the present Bomber equipment of the Air Corps are the two types now in use at March Field. The Keystone Bomber is of the biplane type, with a wing spread of 75 feet, a weight empty of 8,000 pounds, two air-cooled motors of 575 horsepower each, a crew of five, a bomb load of 2,000 pounds and a top speed of 120 miles per hour. The Curtiss Condor, also a biplane type, has a wing spread of 90 feet, a weight empty of 9,000 pounds, two water-cooled V-type motors of 625 horsepower, a crew of five, a maximum bomb load of 4,000 pounds and a top speed of 143 miles per hour.

Several manufacturers have under development Bombing planes embodying to the fullest degree the desirable features previously enumerated. These newer developments show a trend away from the familiar biplane to the monoplane type. One such ship, of which a sample is undergoing test, has a single thick wing into which two 600-horsepower motors are carefully streamlined.

(*Continued on page* 331)

Here and There

with T-2003

CHANUTE FIELD, Rantoul, Illinois, where the Army Air Corps Technical School is located, is commonly called "Cha Nertz Field".

* * *

PANCAKES are flipped over on their backs on a griddle, but when you flip over on your back in a plane that is *not* known as a pancake landing.

* * *

THE Marine Corps is part of the Navy, but nothing makes a Marine Corps flyer madder than calling him a Navy pilot.

* * *

FLIES, in landing on ceilings, pull up into a loop, catch their front feet, claws or paws on the ceiling and then their hind feet, etc. They do *not* go into a half roll and catch on to the ceiling.

* * *

ONLY *one* transit is now necessary in taking sights on the little pilot balloon used at meteorological stations to get wind-aloft data; because a bright lad in the Army Signal Corps discovered that the balloons rise at a definite rate of speed and hence they know how high it is each second. Formerly two transits were used and triangulations made to determine the balloon's height at each sight.

* * *

WITH all so-called lowered costs of everything, medical examiners for pilot's licenses have not generally lowered their fees.

* * *

FROM the time a pilot leaves flying school until he acquires about 700 hours is the most dangerous period—for him.

* * *

THE deadest place in the world is a regular Army or Navy airdrome on a Sunday.

* * *

FORMERLY, when an airplane glided to earth the newspapers called it "volplaning", even years after flyers themselves no longer used the word.

* * *

THAT most present day pilots think the bravest guys in the world are the bozos who flew those old bamboo framed crates where the pilot sat away out in front.

* * *

THAT most passengers in transport planes instinctively call the pilot "Captain" or Skipper" instead of "Joe" or "Hey, feller".

* * *

THAT the best navigators and photographers in the world are *aerial* navigators and aerial photographers—Gatty and Stevens, for instance.

Aviation in England

THERE is a fundamental difference between air transportation in England and that in this country, for all commercial flying in England is to points outside the country such as France, Belgium, Holland and Ireland. Distances are too short and train service is too good to make internal transport aviation a commercial proposition.

As in this country, radio plays an important part in the operation of our commercial flying services. As you probably know, the English channel has a great reputation for fog and consequently a great deal of flying is done out of sight of the ground. This means that the pilot must navigate his ship by dead reckoning.

In order to keep a check on his position, the various ground stations along the route from London to Paris, namely Croydon, Lympne on the English side and Abbeville and Le Bourget on the French side, maintain a continuous watch by means of direction finders on the ship's position. Thus, whilst the pilot is talking to the field manager in the control towers of the different stations, direction finders at two or three stations along the line are measuring his ground position exactly, and to some degree of approximation.

You will notice that I said the pilot is talking to the field manager. Although there is still a question as to whether it is generally better to use telegraph or telephone communication to an airplane, we in England, have decided on the use of the telephone. This is largely because the short flying distances involved and the relatively favorable electrical condition of the atmosphere permit radio telephony to be used. When longer distances are covered and electrical storms are prevalent, as in southern Florida, it becomes necessary to use the more penetrative telegraphic system.

You will probably wonder what language is used for communication to planes flying between France and England. Well, the answer is—both—English and French. The ground station operators at all stations are bilingual, so that the pilot whether English or French, can talk in his native language.

There is one aspect of the communication system that has not been developed on the other side to the extent that it has here. I refer to communication between a prospective passenger and the air transport company. In England, a passenger has either to phone or wire the airline ticket office at his own expense, whereas here you can telegraph a reservation from any Postal Telegraph office in the country at no extra charge. Postal Telegraph also gives service to passengers actually in flight—telegraph blanks being available in the planes which can be dispatched immediately or on arrival at any airport.

Doings of the Aero Sportswomen

by Joan Thomas

The graduation of the Polish Women's Air Reserve, at Warsaw, Poland. These women received the same training and discipline as the male cadets.

FOR the past two years, POPULAR AVIATION had a Women's department, which was cut out a short time ago just to see if the girls would raise a howl. They did!

Consequently, we have agreed to continue it if there is enough interest shown in the page. So women pilots, girl pilots and lady air fans, it is up to you to show us what you do want. Send in anything and everything you hear about women in aviation, whether it is about flight records, saleswomen, advertising directors, airport officials, etc.

The story of individual achievement is always news, but we would also like to hear about the various flying clubs, women's aeronautical associations, etc., that have been formed.

* * *

THE Chicago chapter of The Women's International Aeronautical Association has swung into activity. This association, founded by Dr. Irene Behnke, was organized for the purpose of educating and interesting women in aviation.

It also sponsors air-meets, entertains well-known fliers, and maintains a general bureau of aeronautical information.

The organization is offering to its members a series of aviation lectures which should be of interest, not only to every woman interested in aviation, but to every one who is concerned with woman's place in the progress of the world today.

* * *

A 50 year-young grandmother, Mrs. M. Foster Bain of New York, owns and operates an airplane. She has 200 hours of solo flying to her credit. Even a young male pilot might envy that record.

* * *

Women's records, like the fickle stock market, have taken a turn for the better in the last few weeks and are on their way to a new "high".

* * *

Amelia Earhart started the "rise" with her solo flight across the Atlantic.

Not content with this feat, she took-off in the same ship in which she soloed the Atlantic and made a non-stop flight from Los Angeles to Newark, about 3,000 miles, in 19 hours and 4 minutes, breaking Ruth Nichols' record for distance, which was 2,000 miles.

* * *

In a flight that lasted an hour and twenty-five minutes, Maryse Hilz, the French aviatrix, claims to have beaten the altitude record of Miss Ruth Nichols, by flying to a height of 39,370 feet. Miss Nichols' previous official record of 34,492 feet was established in 1931.

* * *

Mrs. Mae Haizlip, of St. Louis, broke the women's record for land planes at Cleveland with an average speed of 255.513 m.p.h. Ruth Nichols formerly held this record with a speed of 210.636 m.p.h. in a Lockheed Vega—Wasp powered. Mrs. Haizlip flew her husband's Wedell-Williams racer with a Wasp Jr. motor.

* * *

Mrs. Frances H. Marsalis and Mrs. Louise Thaden broke the women's endurance record held by Edna May Cooper and Bobby Trout, when they landed their plane at Valley Stream, L. I., after having been in the air for a total of 196 hours. The former record was 123 hours. Their ship had been nicknamed the "Flying Boudoir".

* * *

Mrs. Gladys O'Donnell of Long Beach, Cal., piloting Ben Howard's Menasco powered racer, "Ike", won the women's open air race at Cleveland, after a driving rain made visibility practically nil.

An Early Bird Views the Races

by L. J. LESH

Comments, pro and con, upon various phases of the National Air Races as set forth by a pioneer flyer and member of the "Early Birds Club."

THOSE of us to whom Nature should have given feathers, must always have something to argue about and at this time it is air shows.

The industry, art, science or what-you-choose-to-call-it of aviation is all a-flutter about the National Air Races on which the city of Cleveland, in some strange manner, has acquired a strangle hold for a period of years.

Having attended air shows, both as combatant and non-combatant, since 1906, this Early Bird rises to emit a few chirps on the subject which he fully expects will be inaudible in the chorus of harsh notes from the mighty eagles, the wise old owls and the gruesome vultures of modern aviation.

There seems to be a certain lack of dignity and frankness in the conduct of the modern air meet which finds full expression from the stentorian throne of the announcer who competes with the judges, the drum and bugle corps, and the soft drink dispensers at these affairs.

How I long, sometimes, to get at that microphone and strike a real key-note somewhat as follows: "Ladies and gentlemen. The next race, which is the classic of this national and international meet, will be between the Standard Oil Company, Shell Petroleum, the Bendix Corporation and Benny Howard—may the best man win."

The National Air Races are sponsored—and how! Whether it is a good idea and just what we are going to do about it is another question—I merely wish to emphasize the fact and the effect.

One thing is certain. The pilots feel that they are being more or less trampled on in the mad rush of big business to sell more gasoline, oil and other commodities and at Cleveland they even committed lese majeste by threatening to go on strike.

Gone are the days when the hero of the skies gave her right rudder, left aileron with the stick back and sideslipped to a joyous landing in a field where a large crowd of anxious pay-hops, free gas and substantial guarantees awaited him with hangar space thrown in.

The glory of the pilot has not dimmed—and the women, God bless them—are just too good. No man who has ever pushed a crate, watched that race in the storm at Cleveland without a prayer for the safety of the game femmes flying pylons blind and a great feeling of wonder as to how the management could have started them in a suicide event. Even the birds had sense enough to come down and seek shelter when that storm charged down on the field, clearly visible before the race started.

The wreck of the Autogiro after its fatal collision with Al Wilson's pusher plane.

The Cleveland affair brought one fact out in sharp relief. It seems that the opponents of pylon polishing will have little to worry about in the future so far as the fast air buggies are concerned. Doolittle, in his Gee Bee, galloping along with his 700 horses (plus) described almost a perfect circle around the course and covered from necessity—not choice—lots of miles.

This year we had an innovation in the form of a vertical race up and back to an Autogiro equipped with sky hooks. Old-timers viewed this event with alarm. One contestant was disqualified for coming down in nothing flat and flying straight into the face of the other flyers coming in across the field—and that was that.

Inverted flying has developed to the point where this writer wonders why some perspiring genius on the ground has not offered a prize for an up-side-down race around the pylons. The first prize should be a Bendix landing gear for the top of the machine.

Al Wilson made his last contribution to the science of flight—and went West. Just why the Department of Commerce, aided by the National Advisory Committee for Aeronautics, plenty of wind tunnels and aerodynamic laboratories in their self-appointed task of promoting safety in aviation, could not have discovered that there is a tremendous down draft above an Autogiro. Why they did not exercise their authority to prevent an airplane from flying into this whirlpool is more or less of a puzzle. We seem to be blessed with a lot of regulations but we could apparently do with more anticipative imagination.

The great feature of the Cleveland Air Races this year, as at all previous times, was the impressive demonstrations of flying by U. S. Military Forces. Formation flights daily by the Marines and demonstrations of bomb dropping within a small circle in the field, constituted a real feature of the program which it is hoped will form a permanent part of every National Air Show. The courteous treatment accorded to visitors who were permitted to inspect the equipment used by the military flyers will be remembered by many old timers who attended the show at Cleveland.

The question is not yet entirely settled but it looks as though we will have the National Air Races in Cleve-

(*Continued on page* 334)

Stop This Annual Slaughter!

EVERY year lives of the most valuable flyers in the Nation are being needlessly sacrificed in a kind of modern-day Roman gladiatorial contest. Pilots are seriously maimed and injured and the entire art of flying is being needlessly stigmatized as the sport of reckless, heedless men.

Of what value is it to aviation when poor Al Wilson, one of America's best, met his death at Cleveland? How does aviation benefit when splendid Lady Mary Heath is headlined in the newspapers, the victim of a bloody crack-up after years of intelligent and conservative flying outside of Air Meets?

These things are needless. They do not further the cause of aviation. They are painful to every true lover of flying progress. They are simply side-show exhibitions, dangerous to the person of the flyers and inimical to the development of aviation. These useless dangerous exhibitions must go. America wants dignified creative air shows that will stimulate flying in this country, not hinder it! If the National Air Races are becoming a substitute for bloody bull fights in other countries, they must be cleansed or discontinued. Aviation is not in existence merely to satisfy the morbid curiosity of crowds of people who will forever be prejudiced from that point on against the grand art of flying.

We would like to know what is behind the Cleveland Air Races. Is it an adventure for profit, or something mistakenly meant for the good of aviation? We would like to know why the sensible lovers of the flying art permit such useless and dangerous exhibitions to go unprotested. Individuals with opinions on this subject should write to the National Aeronautic Association, Washington, D. C., expressing in plain words their viewpoint on this annual slaughter of the flower of America's airmen.—Ed.

Flying with One Foot on the Ground

by FRED ANNES

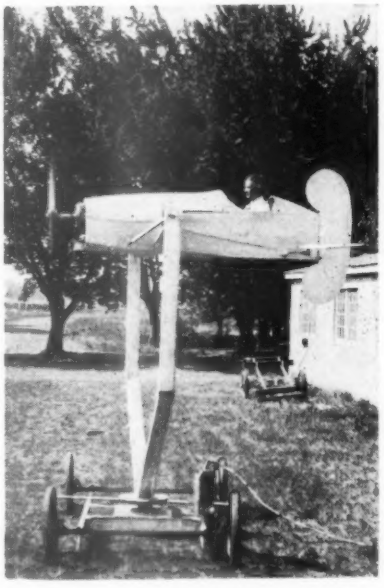
How you can become acquainted with the controls and actually perform all of the flying maneuvers without leaving mother earth.

ONE of the great problems of the flying school in giving flight instruction to raw green beginners, is to familiarize these students with the "feel of the controls". It takes time and practice to learn just how and how much the stick or rudder must be moved to correct a certain flight attitude and when flying in a real airplane, it costs the student a considerable amount of money before he gets the "hang of the thing."

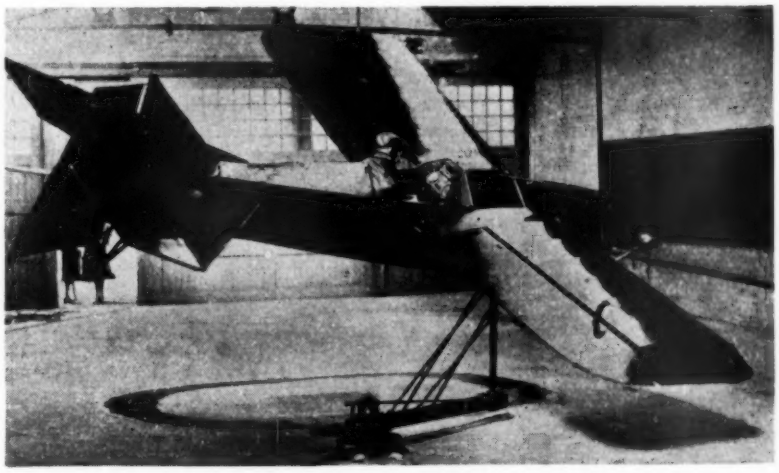
And now enters the "dummy trainer" into the school, by which the student can learn with safety and in a minimum of time. The dummy trainers are only dummies. Mostly they consist of a fuselage freely pivoted to a pedestal or gimbol frame so that the body can swing around freely in all sorts of attitudes, just as though it were supported by the air.

The standard controls, located within the cockpit—the "stick" and rudder—then act on the dummy so that it can be held in proper flight position or else be put through the standard maneuvers of banking, diving or zooming.

One of the first dummy trainers brought out in this country (1918) was the home-trainer designed by A. C. Beech, then instructor for the Moler School of Aviation, Chicago. This was a simple free frame equipped with rudimentary ailerons, elevators and rudder which, when acted upon by a blast from a large blower, could be put through all of the maneuvers of a large plane.



Standing in normal flying position with the Eyerly trainer.



Learning to fly with the Whitlet "Hoverplane" without even going outdoors. The dummy is freely suspended on the wheeled traveler.

This 1918 production was evidently too much in advance of its time for the idea did not seem to be popular then, and the matter was dropped for some ten or twelve years or until the present wave of enthusiasm arrived for backyard training.

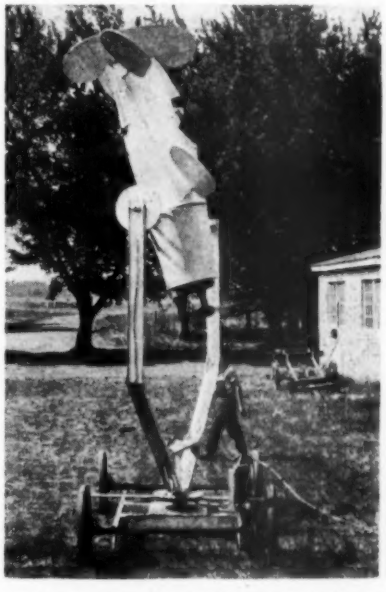
However, during the past two or three years, there have been at least twelve such trainers brought to the attention of the writer. Nearly all of them operate on the same general principles, differing only in details and construction.

In short they can be described or specified as consisting of a swinging dummy fuselage free to swing about in any position and an electric motor driven propeller for providing a breeze for the control surfaces. In one or two cases, the trainer body is supported by an overhead track and trolley so that it can have forward movement as well as angular movement.

Now, this sort of instruction has many advantages over other methods of preliminary training for the beginner. In the first place, being anchored securely to the ground, the nervous student is relieved from the tension of actual flying and therefore makes more rapid progress in getting the "feel of the controls". He can make all sorts of experiments with the controls without the slightest danger of crashing and thereby rapidly gains the self-confidence that is so necessary for the flyer.

Second, this preliminary training can be carried out at much less expense than with an airplane, and therefore his touch and technique can be developed without running up a big bill for "time". No field is necessary—he can learn inside a building or in a backyard for that matter—and the expense for electric current is far below the cost of gasoline. And it is perfectly safe—that's something.

One of the dummy trainers illustrated here is the "Whitlet Hoverplane". This is a small replica of a real airplane, wings, body, tail and all, including the motor and prop. And as will be seen from the photo, it is easily operated within a building of



Taking a steep dive in the Eyerly trainer—or perhaps starting a loop.

the garage or factory type. By its means, the student in the cockpit can be taught to fly straight and level, to make gentle turns or the steep banked turn indicated in the illustration.

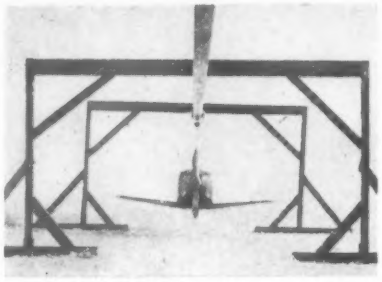
Colored lights placed upon the "instrument board" are connected to the instructor's stand so that the student can be signalled by the instructor. After graduation from this trainer, it is evident that the student can make more rapid progress on the real airplane than a student who has not received this preliminary instruction. This ship has the three planes of freedom, swinging about the pivoted arm on the floor, but still lacks the forward or "translational movement."

Next we have the Eyerly Trainer, developed by Lee Eyerly, a well known Pacific Coast flight instructor. This has more freedom in the vertical plane than the preceding machine, but it lacks the lateral freedom that calls for the use of the ailerons. The body of the Eyerly Trainer is pivoted to a large fork or clevis so that the nose can be pointed straight up or straight down as in a zoom or dive, or it can make a full revolution in a vertical plane if so desired.

Motion in a horizontal plane is had by turning the clevis in the journal at the bottom of the stand, and as with the other trainers, the power for control is provided by an electric motor and propeller. Whether or not it is practical to have forward motion from the small wheeled truck is not known, but it would seem that this would be possible.

A Chicago product, the Bisch Trainer, has interesting points. This trainer has more freedom than the others, for it is suspended by a cable in such a way that it has lateral freedom and therefore gives training in the use of the ailerons. The Bisch is exceedingly simple, and as shown, is suspended from the roof trusses of a garage. It can also be operated satisfactorily in the open.

Very similar to the Bisch, in its means of suspension, is the "Safeflyer" illustrated here. It has the necessary



Here we have the trestles, trolley and car of the "Safeflyer".

three degrees of freedom, but in addition, is suspended from a trolley and track so that it can run forward. This latter freedom is very advisable, for the forward motion gives throttle control practice which is entirely lacking in the other machines described.

This track can be placed out-of-doors and arranged in a circle so that the operation can be made continuous. This is a close approach to practical horizontal flight, and by its means, the effects of forward speed can be learned.

Now, while these trainers teach the principles of the control system in general, notably the balancing of the ship, yet there are several desirable features that are entirely lacking on all of them and which should be incorporated in the perfected dummy if it is to embrace all of the flight maneuvers. With one exception, the matter of throttle control is ignored completely, and even in this one case, only one phase of speed is taken into account.

For example, little or no additional load is placed on the motor when the dummy is nosed up into a climbing position, and therefore, no account is taken of the very important matter of "stalling". Stalls and spins being synonymous, it would seem that this factor of control should be introduced as well as the simple balancing of the ship. A side-slip indicator, stall indicator and spin indicator should be made part of these trainers.

END

Learning to fly in the Bisch trainer which is suspended from the garage roof trusses.

Triangle Parachute Satisfactory

MITCHEL Field Parachute Department personnel are becoming more and more enthusiastic over the Triangle Parachute, now at that station, for service tests, as they become acquainted with the many advantages this type 'chute has over the present standard parachute.

It is nothing unusual to see one or even two men leave planes while flying across the flying field any good flying or jumping day. But the observer's eye is held when he sees not the usual circular parachute open but a triangular 'chute, the triangular type being used quite frequently on the field.

A practiced eye immeediately recognizes the lighter shock load opening, the lower rate of descent, the outstanding maneuverability during descent and the lighter shock load and landing of the Triangular Parachute in comparison with the Standard 'chute.

Recently, Sergeants Pearson and Marchewka, both of the Parachute Department, made a double parachute jump while the anemometer registered a 14-mile per hour surface wind. Sergeant Pearson used a 24-ft. Triangle 'chute, while Sergeant Marchewka used a 28-ft. Triangle 'chute. They bailed out at approximately 2,000 feet. Their drift during descent was in the nighborhood of only 2,000 feet, which shows the desirability of a parachute which can be maneuvered to advantage during descent, especially in a moderately strong wind. Both men reported an exceptionally light landing shock as compared to that one would expeect using a Standard parachute in such a strong wind.

Villagers Set Clocks By Airplanes

RESIDENTS of Southtown, a district adjoining the Chicago municipal airport, don't worry about clocks any more, for just as the villager sets his watch every day by the 5:15 train, the Chicagoans tell time by the clock-like passage of transport planes to and from the airport.

The Southtown district newspaper compiled a schedule of these planes to indicate exactly when the air liners pass over various parts of the district. Chicagoans familiar with this schedule identify the correct time by passing planes.

Cutting Glass

IF IT becomes desirable to cut a bottle, glass, or similar object, then fill it with any kind of oil up to the place where it should be cut. Now heat a proper piece of iron red hot, and quickly plunge it into the oil. Directly a click will tell that the job is done. Don't try this in your parlor, and beware of the resulting sharp edges.

Howl Department for Amateurs

Here we have the howls and counter-howls of the amateur lightplaners who are grounded by various weird and unreasonable state laws.

THIS department's theme would make a good title for a song, "The Amateur Aviation Blues". So far, we've had plenty of words, but no music to go along with them—at least nothing jazzy enough to put over the sentiments expressed.

We are hearing from many different states and are learning of the peculiar individual problems that the amateurs in these states have to face in making life safe for amateur democracy. The states of Oregon, Ohio and California have been particularly well represented in these columns and we trust that amateurs in the other states will write in and get a load off their chests.

What we can't understand about this license business, among many other things, is the insistence of governing bodies toward drastic laws and inspections for airplanes. In so doing, they are drawing an illegal distinction between vehicles, allowing unlimited freedom to automobiles while clamping the lid down tight on planes. If they would enforce an inspection of some of the old Model "T" Fords and 1918 Chevvies that go gallivanting around our roads, they could work out their spleen without a single objection from anybody.

Taking the lightplane out to the field for a weekend's pleasure. Is this sport to be prohibited?

An ancient automobile is infinitely more dangerous to the public at large than any airplane could possibly be, and yet little is done to regulate the condition of cars! Defective brakes or steering gear can cause more fatalities in five minutes than an airplane could cause in its whole life. Again, nobody has ever insisted on making a top overhaul on an auto motor at the end of every 150 hours, or any number of hours for that matter, and yet this very same thing is demanded of an airplane engine owner.

Did you ever hear of a tire manufacturer being required to submit stress sheets to the Department of Commerce for his tires? No, but these same tires are blowing out, day after day, running cars into the ditch with attending fatalities and nothing is done about it whatever. And you often heard, if you read the newspapers regularly, that automobile engines very frequently stall right in the middle of the railroad tracks, just in time to get swiped by the fast express.

It is not because we are hot after automobile inspection laws that we make this statement, but for the reason that it is an open and shut case of unlawful discrimination between two different types of automotive vehicles.

Well, after letting out our private little howl, we will turn the matter over to our contributing howlers who are getting mighty efficient. First on the list is Mr. F. C. Flegge, Searcy, Arkansas, a new howler member from a new state. Let us harken unto his lament.

I have been interested in aviation for more than ten years and have also studied aircraft construction for the past six years. Have owned two planes in the past year and I feel that I should at least know what I could do and wish to do.

About six months ago, I started work on the plans for a light sport plane. This little plane was to be a low-wing high-speed model using a motor of between 30 and 45 H.P. I went so far as to get the exact price of the material from a supply company, and found I could build this plane for about two hundred dollars—less motor.

But just before starting work on it I found I would not be allowed to fly it here in the state. Although this is disappointing and disgusting, I consider myself much luckier than a lot of other fellows who have their planes built up with all the cash they could get hold of invested in them.

Who said this land of ours was the land of the brave and the home of the free? No one believes that except those saps up there at Washington who are supposed to make laws. But even they have more consideration for us than these local lawmakers who don't do anything but ride around in a nice cabin job and tell us poor devils just what we can fly and what not.

Who made aviation what it is today, anyway? It wasn't the high-collared lawmakers as they would like people to believe. No, sir. It was the amateur, just like radio and everything else. If these big technical engineers, or whatever they call themselves, could do the miracles they claim with paper and pen, then why didn't one of them draw a successful plane on paper and have it built before the Wright brothers—who were just amateurs—built and perfected their plane?

It is true the Department of Commerce is necessary for commercial aviation on mail and passenger lines. But why should they step in and place restrictions on individual flyers? Here is another thing that makes me hot under the collar. Just why do the state aeronautical inspectors place so great an emphasis on all unlicensed plane crackups when a licensed plane can crash and chances are the newspapers will not even print one word of it?

Last December, one of my planes, which was unlicensed, went into the Arkansas river and crashed due to an error of the pilot, who happened to be a licensed pilot. Now my plane got all the blame for this crackup and a nasty writeup in the newspaper. It so happens that just three days before this, a licensed plane belonging to a local flying field and flown by a licensed pilot, who had taken just one drink too many, cracked up less than one block from where my plane came down and here is the newspaper's story of it:

"Airplane forced down on north side. Plane runs out gas and makes forced landing. Refuels, takes-off and lands back at the Municipal Airport."

I can verify the fact that this plane was washed out and hauled back to the airport by truck.

Where is justice anyway? What the devil has politics got to do with aviation? How do these big guys in the game get it just as they want it? How do they keep under cover just what they don't want exposed? And why do they try to cast reflections on all those in poorer financial conditions that are struggling in the same game.

Here's the answer or at least part of it. In the first place the big boys in the game have money. We all know money means influence, and influence plus crooked politicians spells doom for us of small means.

It is true that if we were allowed to build our own planes and fly them, several industries would suffer. First, the airplane constructors would not prosper. Second, the airplane flying companies would not get so many students as they are getting now. But the aviation industry as a whole would prosper, because there would be one hundred engaged in flying where there is now only one.

I could go on and write a whole volume concerning the unfairness in this business, but it would be useless, as I stated before, because it requires a pull. And the only chance and hope we of smaller means have got is co-opera-

XUM

tion among ourselves. And the assistance of a few good magazines like POPULAR AVIATION.

I feel that POPULAR AVIATION *can work miracles towards helping amateurs and home-builders to have our just rights in the game, as it has helped us out of other problems before.*

So here's wishing all the amateurs and home-builders the greatest success in the world. And trusting with the aid of POPULAR AVIATION *we may soon remove the obstacles that are now before us.*

Yes, what you read in the papers about a crash depends a great deal upon who you are—financially speaking. Poor little Tom Jones with his flivver plane has a little trouble, and he is condemned as a criminal. On the other hand, J. Malcom Truax, the local magnate, can crash and completely demolish his corporation built ship, and the blame is then put on the shoulders of the unfortunate pilot. This lets out the owner and the privileged builder of the plane.

* * *

NOW comes to bat one Homer Agar, a pilot and the principal of the Langdon High School, Langdon, N. D. We welcome Mr. Agar and his letter is made doubly welcome by the fact that he is the first disciple of aviation reporting from North Dakota.

I have read so much comment in the new licensing laws of some states, that I thought I'd like to let some of the readers know who are caught in the jam, what we did about it out here in North Dakota.

In the first place, North Dakota is quite air-minded, having numerous planes and private and professional pilots. We, of course, have had our scourge of Jennys and Canucks, but they have done their bit in helping to sell aviation to the public in the past. In this one county we have eight serviceable planes, new productions, including a Cessna, which figured big in the Miami races some short time ago.

But now to get down to the subject. Everything was going along good when some overenthusiastic exponent or exponents of the progress of aviation took a notion that the federal government didn't know much and that North Dakota should become one of the esteemed revealers of the light.

Since everything nowadays from a go-cart to a hot-dog stand is licensed, it was easy to convince the legislators that airplanes should fall in the same category. The law was passed stating that no unlicensed plane could be flown in the state.

Here, in our town, we were stuck with four perfectly good airworthy new-production ships that couldn't be licensed without time and red tape. Now it seems to me that if I want to put a motor on a hayrack on my own land, and break my fool neck, it's nobody's business.

A few of us locally got together and started an investigation. We first

(*Continued on page* 328)

A Radically Different Airplane (*See front cover*)

Side elevation of the Brown airplane showing the arrangement of the propeller and stabilizer-rudder.

BEN BROWN of Lawrence, Kansas, a former research engineer of the Bell Telephone Laboratories, has now completed his second experimental airplane.

Mr. Brown built the first machine to test out new and inexpensive types of wing construction and also to test out in a full sized airplane the advantages, if any, of a very high aspect ratio. While the first ship proved to be quite satisfactory and was flown as an experimental ship for over a year, the information secured from the tests led to the construction of a second ship of an entirely different form.

Before the second ship was constructed an accurate model was made and thoroughly tested in the wind-tunnels at the Bureau of Standards and the University of Kansas. The tests made in these wind-tunnels checked very closely and indicated satisfactory stability and performance characteristics.

It is a pusher type, strutted tandem-wing cabin plane. The lift strut is of the same chord as the wings and is a lift section. It is attached to the tip section where the tandem wings join in a large "V". This method provides a stiff wing structure combined with the simple narrow chord wing construction developed in the first model.

The engine is enclosed in the cabin at the rear of the passenger compartment. It is cooled by means of a fan which draws air past the cylinders in a manner similar to an aircooled automobile engine. The tests have shown the cooling to be entirely satisfactory. The propeller is driven through a hollow extension shaft mounted on ball bearings and connected to the engine by a flexible coupling.

While the experimental ship is built in the form of a two-place, side-by-side seating model the designer believes this type of plane is particularly adapted to the large passenger transport type. The passenger cabin hangs directly beneath the wings and is supported from both ends rather than from one point near the middle as is the practice in the planes now in use.

This method of support cuts down the stresses in the fuselage framework and permits of a much lighter structure. The pilot's seat is in front where he has an unobstructed view in all directions. The engine is enclosed in the cabin where it can be oiled and adjusted by a mechanic while in flight and by having the propeller in the rear the noise is much reduced and the high slipstream velocity past the cabin is eliminated. The general specifications of the test ship are:

Span, 44 ft. 9 in.; Engine, Cirrus Hidrive, 95 hp.; Chord, 2 ft. 3 in.; Fuel capacity, 24 gals.; Wing area, 280 sq. ft.; Oil Capacity, 3 gals.; Overall length, 19 ft.; Wing loading, 6.16 lbs. per sq. ft.; Cross weight, 1725 lbs.; Power loading, 18.16 lbs. per hp.

Front view of the Brown plane showing cut out portion in main wing and strutted wing. The ailerons are in the wing tips.

Simple Lessons in Meteorology

by JAMES A. SIMPSON

In this letter, Charley introduces Jim to the clouds, their names, what they look like and what they predict.

Dear Jim:

Your last letter cheered me up quite a bit. I was beginning to lose hope of ever getting this meteorology dope across to you. Then you come along with at least three fairly intelligent questions that indicate you must have put in some very slight amount of time at your end.

When I came to, I was slumped over my desk with that homely redhead who writes my letters pouring ice water down my neck. Don't surprise me like that again, Jim. You know that the only reason they stuck me in this blasted ground school was because of my weak heart.

I'd like to publish a few of your interesting if sarcastic comments, but right now with the election coming on, the price of asbestos paper is soaring, and I couldn't print your remarks on anything else without starting a fire.

In this letter I promised to tell you about clouds; what they are, where they come from, and what they are good for.

Well, Jim, clouds are good for a lot of things, including making the grass grow in the good old summer time, and making the moon look pretty on a nice winter night. They are also of occasional use to punks like you when you learn enough about them to be able to know what they are up to. You know, Jim, it's funny about clouds. They usually are up to something, if you can only guess what it is. I can only remember one spell of cloud study that I would call plumb wasted.

I'd been up north on a fishing trip—it's a good many years ago, now—and the sun was pretty warm the first few days I paddled home from the only real, honest-to-gosh fishing hole I ever discovered. Naturally, being one of these platinum blondes you read about I took a wonderful dose of sunburn. Neck, shoulders and arms.

A swell affair, with elegant water blisters and all the trimmings. Well, Jim, I went around for a week with zinc ointment and other dope all neatly battened down under gauze bandages, and did I suffer! Meanwhile, the sun was hotter than blue blazes, and I had to keep strictly in the shade.

BY the end of the week I was one of the best little cloud-observers you ever saw. Every evening a nice fluffy mess of clouds would gather in the western sky. That night I'd pray for rain and cool, cloudy weather, so that I could get out of doors without having the sun burn up my baked anatomy.

Looking up at an advancing thunder storm. This is a cumulo-nimbus cloud with the white cumulus at the right and the black nimbus at the left.

I studied 'em, watched 'em drift around, and tried to dope out when that hot spell was going to break. Finally I gave it up in disgust and started for home.

Fifty miles out of camp the weather changed, a storm blew up from the northwest, the sky was overcast in a half hour, and the temperature dropped from the high nineties to the low fifties. And to show you what a good cloud-reader I was in those days, I didn't even have an overcoat with me and had to drive three hundred and fifty miles in an open car!

Clouds are funny, Jim. They are a good deal like the state of a man's feelings, because we classify them as "high," "intermediate" and "low." I don't mind telling you that the high ones are pretty high. Some of those fleecy little drifters I was studying on my fishing trip were up close to fifty thousand feet, for a good, hard-working cirrus formation often keeps well above ten miles from the earth's surface.

Then again, the low clouds are so close to home and neighborly that they often take a swipe at the surface of the earth itself. We call it fog, but it really is nothing more than a cloud touching the earth.

What we call "high" clouds are composed mostly of minute particles of ice. In general, however, clouds are made up of very small drops of water. These particles naturally tend to fall toward the earth. Being microscopic in size they don't fall very rapidly, but sort of drift down by easy stages. When they hit a warm spot in the atmosphere they change back to vapor.

Now and then they hit an ascending column of air that carries them back about as fast as they fall, so they seem to float. You know how gracefully a cloud of steam floats away from a locomotive stack, Jim. That's just a young, man-made cloud rising on a current of warm air.

People have peculiar ideas about clouds. They seem to think clouds have stability and substance. I'll admit that some of them look like a batch of whipped cream or the business end of an ice cream cone, but the fact is that clouds are a sort of atmospheric state of mind. They merely mark the spot in the atmosphere where something is going on. The process is the condensation of water vapor. Owing to certain laws of nature this process of manufacturing water vapor cannot take place without clouds being formed.

CLOUDS are mighty useful to the aviator as indicators. They also are a handicap to him, for they tend to restrict his operations. As indicators they can be depended upon to give at least a fairly good idea of the forthcoming weather, particularly if the nature, height and general characteristics of the clouds are definitely known.

I'll try to give you a rough outline of the various kinds of clouds, Jim, and about where you'll find them in the atmosphere when you start chasing 'em in your own ship. My only word of caution is this: Don't try to get through some of those fleecy cirrus babies, for

you may find them so blamed high that there isn't anything up there for your prop to grab hold of, let alone for your lungs to breathe.

And, when you take your ship into a nice, moist cumulo-nimbus cloud don't kid yourself too much about its thickness and try to outclimb it. Some of those cumulus clouds, that are only a thousand feet to a mile above the earth are six miles thick!

Now, Jim, Old Timer, I'm afraid I've got to get technical, and knowing your emaciated mental state I hesitate to do so. But the really important part of this lesson is the identity of the various kinds of clouds you are likely to encounter.

To make it as simple as possible for an imbecile like you, I am going to remark that high clouds are usually known as *Cirro* types, intermediate clouds are classified as *Alto* types, and the low-lying clouds are divided into five different groups. The three groups of Cirro or high clouds are *Cirrus*, with an average height of 29,000 feet, the *Cirro-stratus*, found about 24,000 feet high on the average, then the *Cirro-cumulus*, running around 19,000 feet.

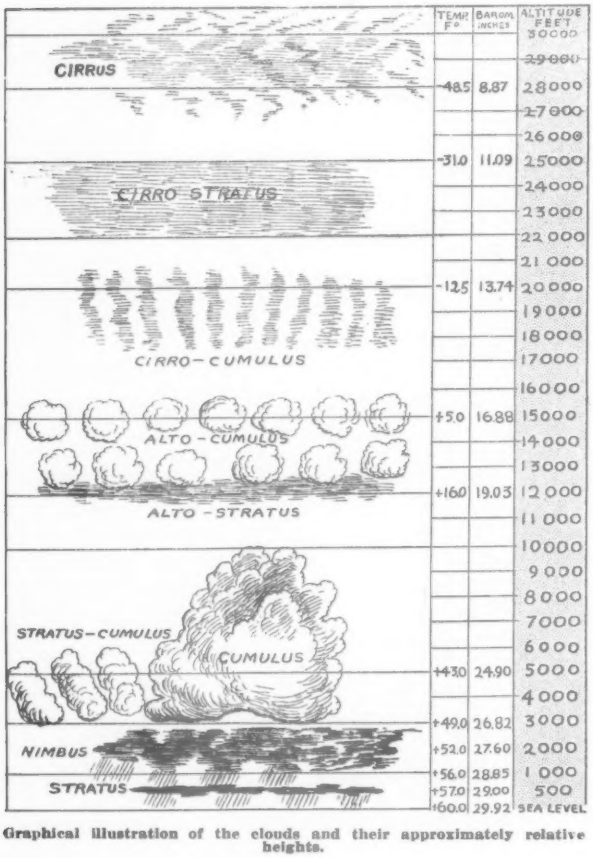
Cirrus clouds are delicate, fleecy and feathery, white in color, and may take almost any old shape from tufts and bunches to wisps, strings, threads and curved or straight filaments. They are composed mostly of ice crystals—not cubes, Jim—crystals.

A hole in the nimbus clouds.

Cirro-stratus, the second group of Cirro clouds, are more likely to be a thin white blanket; often covering the entire sky, and causing halos around the sun or moon under certain conditions. Cirro-cumulus is the typical "soap-suds" sky we know as "*mackerel.*" It is found at altitudes varying from two miles to fifty thousand feet.

The intermediate clouds, or *Alto* types are identified under two groups, *Alto-stratus*, a thick sheet of gray of bluish color that is rarely encountered below 6,000 feet, and the *Alto-cumulus*, found as low as 14,000 feet and as high as 36,000 feet. This type is made up of large globular masses, white or grayish in color, and packed so closely together that the edges overlap.

There are five groups of lower clouds usually found below 10,000 feet. These clouds, Jim, are apt to be thin, ranging from 1,000 to 2,000 feet in thickness, with the exception of the *Cumulo-nimbus* type, which is the tall member of the family and may run from 7,000 to 30,000 feet from base to top.



Graphical illustration of the clouds and their approximately relative heights.

NO. 1 is called *Strato-cumulus*, and is made up of large masses or rolls of dark cloud. In winter these will often cover the entire sky. They may appear as huge rolls laid one upon the other, in parallel lines, and while they have a dark and stormy look, you can usually bank on their not turning into rain. No. 2, called just plain *Stratus*, hangs low around 500-1,000 feet, and is a uniform covering like a fog. When broken up by the wind or around the tops of mountains, it is known as *fracto-stratus.*

No. 3 is the *Cumulus type*, with a flat base and dome shaped top. They are caused by ascending air currents, and "bumps" may be expected when passing through or under them. Cumulus are the best looking of all clouds, especially in the evening when the sun shines on their deep, tufted surfaces. Their average altitude is about 4,000 feet.

No. 4, *Cumulo-nimbus* are found around the mile high level. These are thunder or rain clouds, and are dark, heavy-looking, with rain or snow falling from the base. These are good clouds to stay away from, Jim, for the vertical air motion in front of a cumulo-nimbus may be as high as 2,500 feet a minute, and harder to outguess than a bucking horse.

No. 5, the last type of low cloud, is the *Nimbus*, found at about 2,000 feet. Nimbus clouds are recognized as a thick layer of dark clouds without any special shape, and with ragged edges from which we get most of our good, steady rains or heavy snow storms.

I'm not going to take much time to tell you about fog, Jim, for while it is a cloud, there just isn't anything you can do about it. About all I can tell you is that the Navy says a fog is dense when you can't see objects at 1,000 feet, and any old mist that cuts down visibility to less than 550 yards is a fog to a Naval meteorologist.

Here are some important facts to remember: If three-tenths or less of the sky is obscured by clouds it is "mostly clear" or just plain "clear." Four to seven-tenths obscuration is called "partly cloudy," and eight-tenths or more is known as "cloudy" or "mostly cloudy." A totally obscured sky is known as "overcast."

In my next letter, Jim, I want to give you a few methods of computing cloud height or ceiling, and, if my proverbial good nature holds out, take the trouble to explain how a weather map is made. Until then I suggest you stick your head out of doors and see how many of these cloud types you can identify, and write me about it.

And you know these heights are approximate—the clouds don't float in such a way that they come precisely in even inches. A sudden change in the air density will change their altitude.

And remember, keep away from those Cumulo-nimbus clouds with the black rolling base and the high dazzling white peaked "thunder-heads" above them. They're bad medicine—believe me.

I'd appreciate it if you continue to manifest the faint trace of interest in meteorology that your last letter revealed, for you've got to admit this course you got me into is a sort of thankless job!

Yours,

Charley.

Getting Speakers for Aero Clubs

by T-2003

Did you ever face the problem of getting a celebrity to address your aero club? Well, T-2003 tells how to do it—and he knows.

"WE MIGHT ask Jim Biggs."

"Aw, he'll take up ten minutes of the fifteen minute speech by tryin' to sell the gang some of his airplane models."

"We could write to the, uh, to whatsisname, the Aviation Department or something in Washington to send us a speaker for our club meeting and....."

"Yeah, two days each way for the letter and our meeting comin' off in three days and we ain't high-powered enough to send anybody from Washington for to give a talk to about forty fellers and their girls in our little club."

"O. K., brother, you're the entertainment committee—so the grief is yours."

I'm asking you members or former members of Aero Clubs or similar organizations, how often has the foregoing happened to you or to your fellow members? Having sponsored two clubs, having spoken at exactly ninety-four others, sometimes in common with really good speakers, having answered hundreds of letters asking for advice on how to put this or that aero club over with a bang, I think I can give advice.

YOUR club may be one owning one or a half dozen planes. It may be one that is trying to raise money to buy a plane or one that is pooling its members and getting group contract instruction rates from a nearby school. Or it may be one that doesn't even own a club-room or equipment, but meets in Joe's or Jack's cellar or at the American Legion Hall gratis, to discuss aviation and swap lies, photos, models and that is more important—dreams.

One and all, they must be held together by something in which all members are interested, something which costs little or nothing to the club and which, in addition, provides the bunch with entertainment. (Webster's synonyms for the word are, "amusement, diversion, recreation, pastime, sport, feast, banquet, repast, carousal.") Not badly put, for without entertainment (see synonyms) the best managed club from a financial standpoint, falls flat and loses the interest of the members and then their membership.

Well, leave out the *carousal* part of it if you feel that way, but what I mean is that new ideas must be brought into the club as well as new members, if the club is to survive. Especially, if the new ideas are supplied gratis and offer no opportunity for dissention and squabbling among the members.

About asking Jim Biggs, manufacturer of models and model kits, to come in and address the club at its meeting.

Every club must be active, else it will fall to pieces. A glider usually helps a whole lot in maintaining interest.

Suppose he *does* spread mention of his wares during his talk. Isn't he entitled to do so in return for talking for fifteen or twenty minutes about how to build models, lay out miniature airports or materials of construction or the like? How about the advertising you hear along with entertainment on the radio?

The chances are that Biggs will never mention his business activities. If he's interested and unselfish enough to give the boys and girls a talk, he's so interested in his subject that he'll want to use up the time allotted to him in telling how he learned to fly, about different types of airplanes and their construction or the like.

Several months ago, I spoke at a flying club dinner and who should sit beside me but Walter Hinton himself! Of course, he was the guest of honor and his was the crowning talk. He just rambled on about his experiences, the first trans-Atlantic flight, that nearly-North Pole balloon flight, his pigeon diet and his experiences up the Amazon. The bunch were spell-bound.

He could have talked for an hour longer and rung in mention of his school a hundred times, but never once did he bring his own means of livelihood into the story. He was speaking as one flyer of experience to a club of other flyers who hoped some day to fly where he had and who wanted to hear about flyers and their flights.

Me? I spoke about pitfalls for flying clubs, having just made a lengthy study of the subject. "Why Clubs Go Wrong Instead of Strong." Other speakers there were too,—a foreman of an aviation repair shop, two flying instructors, a medical examiner and a newspaperman who wrote an aviation column.

But how to go about getting entertainment for your club or association?

IN THE first place, don't ask a million-dollar speaker to come to a ten-cent shindig. Pick someone who speaks the language of your outfit. Next, give your prospect enough time. Three weeks is usually O. K., and then three days before the meeting it's a wise stunt to call him on the 'phone and ask him if there's anything you can do for him, thus in a courteous, roundabout way reminding him of his appointment. Also be sure he knows where your meeting is to be held, how to get there and for whom to ask when he does get there.

Ask him or her to speak on definite subjects if you can, and ask the prospective speaker if he needs a blackboard. Advise him how many will be in the audience and their average ages—if a juvenile club. And after it's over, be sure to write a letter of thanks to the speaker of the evening as well as to his boss if he, like most of us, works for a living.

Speakers may often be rustled up by asking at some of the following places—Operations manager of a local airline terminal, manager of a local flying school, Department of Commerce inspector, Army or Navy flyers, local manufacturers of civilian products or local flyers of note.

Contrary to expectation, airline pilots, as a rule, do not care to speak. Two reasons,—"Joe Doaks settin' himself up for a hero again," remarks a fellow pilot. This is reason number one; and also, airline pilots are seldom sure of being in town on any definite date in the future.

The operations manager or his assistant, if they will, can tell lots of stories of the personalities of the men in those planes you see flying overhead day and night, on schedule. Flying schools are out to attract those interested in flying, and a school representative can often give good dope on financing your instruction dues. Even if your club owns a plane, a good school looks on the members as prospective post graduate flyers who might patronize the school for advanced work in larger ships.

Department of Commerce inspectors are the birds to give you a talk—if they will. Thirty per cent will; thirty per cent would if they could only talk fluently and the other forty per cent won't for several reasons. Among such are, (1) "they work at it 8 to 10 hours a day, their whole association is with aviation and it's "nuts" and in their spare time they would rather whittle ship models, go to the movies, correct papers, etc.; (2) They don't wish to be under obligations or have under obliga-

tion to them any of the folks who might later have official dealings with them; (3) "Let George do it."

But the approximate thirty per cent who will talk; ah, boy, you have interesting entertainment there. Ask them to tell of their experiences, ask them to give you advice on learning to fly, or on co-operating with them.

ARMY or Navy flyers may be reached by addressing the Commanding Officer of the nearest Army flying field or the Commandant of the nearest Naval Air Station, or Commanding Officer of the nearest Naval Reserve Squadron. The Air Officer of the Army Corps Area in which you live is the one to whom you might address your request for assistance, or the Commandant of the Naval District, if you want Navy birds.

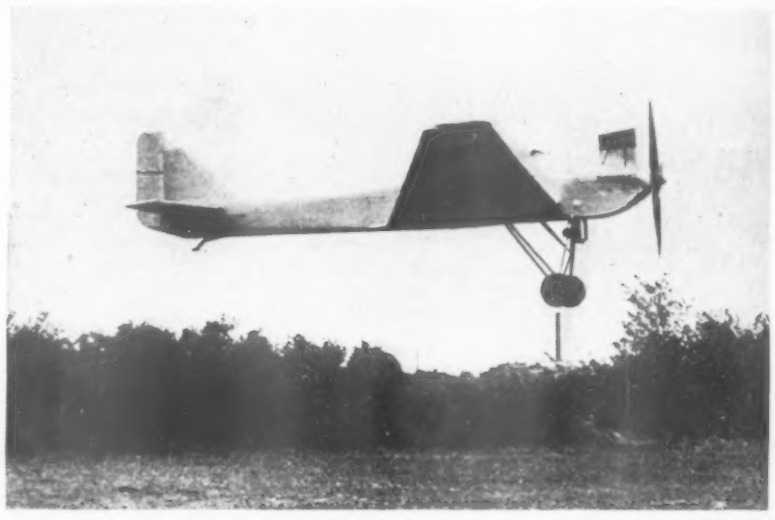
If uncertain about your area or district, write to the Bureau of Aeronautics, Navy Department, Washington, D. C., or to the Office, Chief of the Air Corps, War Department, Washington, D. C. The latter office loans motion pictures and lantern slides of Army flying and Air Corps developments to educational institutions and to those of its officers who wish them for help in illustrating a lecture. Practically all their film is in standard size, very few films are the 16 mm. (home) size.

Unless he has kept up with aviation since the war, a war-bird won't know as much of present day airplanes or flying as you fellows will, hence, it's best to ask the Army or Navy authorities for someone on the regular or reserve list to give the talk. In writing, give all the dope previously referred to about your club or association.

The Army Air Corps, Naval Air Service and Aeronautics Branch of the Department of Commerce, issue certain pamphlets free upon request. These describe the work of their department and make good additions to your club library. The Army Signal Corps in Washington sells 8 x 10 in. photos of wartime and present day planes for 15 cents per print, and the Air Corps has a limited number of such photos available for distribution. Ads in this magazine give plenty of dope about where to get models, prints and photos; and all of these are interesting assets to your club-rooms. For that matter, by stringing up several models of fighting planes to simulate an aerial combat you, or any amateur photographer, can take pictures that are a credit to any club-room wall.

Oh, yes, manufacturers of aviation products, or local flyers of note. Ask 'em; but remember they are generally very busy men and it's sometimes hard to get 'em out. Don't be sore if the manufacturer boosts his product, nor expect Wiley Post or Jimmie Doolittle to come and say hello to any but a gathering that is high-powered enough to warrant it. There are other famous boys in lesser proportion who might say a few words at your outfit. How about some local boy who just got his transport license, or the lad who was mechanic for some famous plane?

Fast Travel With the Rocket Ship—Maybe?



Here's the Junkers stratospheric plane, the forerunner of the proposed rocket ship. But neither the plane nor the rocket ship has yet attained its objective.

IF a rocket-ship would make a week-end trip from Berlin or London to Toronto and rush this nearly 6,000 kilometers (3,600 miles) in less than three seconds the rocket could start at Saturday 9 o'clock in the morning and arrive at Toronto at 3:00 A. M. on the same day! This would be six hours earlier than she started by Toronto clock time.

Why? Well, the difference in the time is six hours, as you know, and in flying from east to west, the arrival would be that much earlier. If the flight was prolonged to six hours ,the rocket ship would arrive at the same hour that she started—by Toronto clocks.

However, today we cannot fly in three seconds from one continent to the other, but great efforts are being made on both sides of the great water to very materially reduce the present time which is now in the neighborhood of eleven hours.

It is already possible to fly with a speed of 10 kilometers (6 miles) in a minute. The stratospheric ship will bring this up to 18 miles per minute and the rocket-ship will rush it up to 240 miles per minute. It seems impossible at first thought, but you may be convinced that it will be true in a few years. It is necessary that the rocket-ship has to rush at such a speed, as she will not work economically at slow speed. If the ship did not have such a high speed, the proportion between the load of the machinery and the load of use would be too unfavorable.

It is evident that not all the difficulties are overcome with rockets but scientists in Germany expect that in 15 years, or so, it will be possible to have an efficient rocket-ship which will be practical to use on ocean flights.

The ship will be an all-metal structure in which the cabin, as compared to the size of the ship, will be very small. It must be started by an external engine, or better, by a sledge-road. That means that the ship will actually be catapulted and that she will fly as an airplane flies during the first moment. Then the rockets will begin their work.

At this time, the flying ship travels faster and faster and finally it shoots through the stratosphere like a cannonball. The sledge-road must be very steep, of course, as the air is very dense and presents a very high resistance at this high rocket speed.

Then above—in the stratosphere or still higher—the final direction of the flight will be taken. Here, the rockets develop their full power and give the ship the right speed. It is said that mankind can suffer a speed of 24 miles per minute and at such speed it is a striking fact that the weight of the passengers will grow fourfold and that they will feel very heavy on their limbs.

German scientists believe that when we fly at a height of 60 miles above the surface of the ocean, that a full speed of 240 miles per minute will be developed. Nobody knows positively if it will be very hot or cold at such an enormous height. The distance between Berlin and New York — 2,400 miles — should be accomplished in 15 minutes.

The most difficult task will be the landing. If the ship should descend at 240 miles per minute in the dense viscous air of the earth, then the ship would likely be kindled by the air friction like a shooting-star. Therefore, it will be necessary to give a "reaction" braking effect to stop the ship by opposing rockets in the bow. At the same moment, the wings expand, for they are telescopical. It is evident that at starting and in normal flight the wings would vary the speed. With ordinary wings then—at the landing—the rocket-ship becomes an airplane and comes down to the aerodrome exactly like other planes.

Question and Answer Department

THIS department is open to the readers of POPULAR AVIATION, and questions are welcome, just so long as they pertain to the general subject of aviation.

Address your query to POPULAR AVIATION, Question and Answer Department, 608 S. Dearborn St., Chicago, Ill.

* * *

All questions of general interest on any phase of aviation will be answered authoritatively by Popular Aviation's Technical Staff.

QUESTION. John A. Harms, Miami, Fla.: Please explain how the controls of an airplane work and what they do when the ship is in flight.

Answer: We have received so many questions on this subject of late that we finally decided to make a real job in answering the query, and to show all of the parts entering into the control system, even though it took the whole space of the Department to accomplish this deed. The accompanying diagram, we believe, illustrates all of the points in question.

Now, to begin with, an airplane in flight is free to move in three "planes" or in three directions. It may be disturbed in any or all of these directions by wind gusts, rising currents of air or other causes so that the attitude of the ship must be corrected to meet these conditions if it is to continue along a straight line of flight.

Again, the pilot may wish to point the nose of the ship up or down, for climbing or descending. He may wish to turn to the right or left, and in so doing, must bank the wings up at an angle to take care of the centrifugal force. Or, the pilot may wish to side-slip his ship by standing it on the tips of the wings. All of these conditions call for control by the pilot.

A glance at the diagram (B) shows the three "axes of freedom," in which the ship must be controlled. First, the ship can turn about its longitudinal axis (X-X) or the "axis of roll," as it is called. The wings rock from side to side on the axis in rough weather, or the ship is turned about the axis in banking around turns or in side slipping.

Next comes the transverse axis (Y-Y) running along the length of the wings, and the ship turns around this axis when pointing the nose up or down for climbing or descent.

Third is the vertical axis (Z-Z) frequently referred to as the "axis of yaw", because it is around this axis that the ship "yaws" or is steered in a horizontal plane, from right to left, by the rudder.

Now, all of the controls on all of the axes are simply small hinged or pivoted surfaces, called the "control surfaces" which can be adjusted by the pilot at will. They are hinged like hinged doors, and cause the ship to move when they are set at an angle with the wind-stream. In effect, the action is very much the same as the action of moving water on the rudder of a boat, and as with the boat, they are only effective in a moving stream of fluid. They cause no effect at all in still air.

The three principal controls are the Ailerons, the elevators and the vertical rudder.

The vertical rudder steers the ship left and right in a horizontal plane. This surface is moved by the foot rudder bar or rudder pedals.

The elevator flaps, at the rear of the ship, are moved b ythe back and forth movement of the "stick" in the hands of the pilot. This causes climbing or descent.

The ailerons on the wing tips give lateral balance.

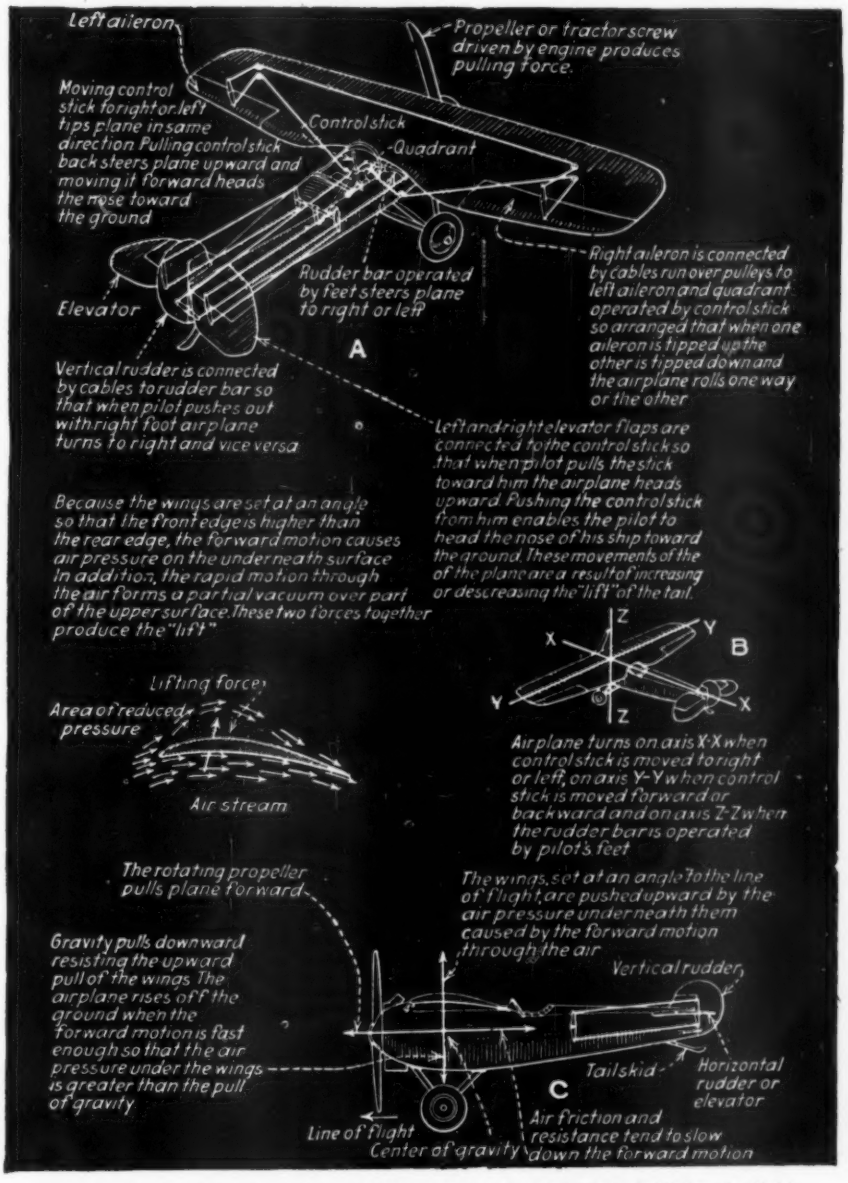

Left aileron
Propeller or tractor screw driven by engine produces pulling force.
Moving control stick for right or left tips plane in same direction Pulling control stick back steers plane upward and moving it forward heads the nose toward the ground
Control stick
Quadrant
Rudder bar operated by feet steers plane to right or left
Elevator
A
Right aileron is connected by cables run over pulleys to left aileron and quadrant operated by control stick so arranged that when one aileron is tipped up the other is tipped down and the airplane rolls one way or the other
Vertical rudder is connected by cables to rudder bar so that when pilot pushes out with right foot airplane turns to right and vice versa
Left and right elevator flaps are connected to the control stick so that when pilot pulls the stick toward him the airplane heads upward Pushing the control stick from him enables the pilot to head the nose of his ship toward the ground These movements of the of the plane are a result of increasing or descreasing the "lift" of the tail.
Because the wings are set at an angle so that the front edge is higher than the rear edge, the forward motion causes air pressure on the underneath surface In addition, the rapid motion through the air forms a partial vacuum over part of the upper surface. These two forces together produce the "lift"
Z
Y
X
B
Lifting force
Area of reduced pressure
Air stream
Airplane turns on axis X-X when control stick is moved to right or left, on axis Y-Y when control stick is moved forward or backward and on axis Z-Z when the rudder bar is operated by pilot's feet
The rotating propeller pulls plane forward
The wings, set at an angle to the line of flight, are pushed upward by the air pressure underneath them caused by the forward motion through the air
Gravity pulls downward resisting the upward pull of the wings The airplane rises off the ground when the forward motion is fast enough so that the air pressure under the wings is greater than the pull of gravity
Vertical rudder
Tailskid
Horizontal rudder or elevator
C
Line of flight
Center of gravity
Air friction and resistance tend to slow down the forward motion

Chart showing the standard controls and the methods of maintaining equilibrium in flight.

A Lighthouse on Wheels

The rolling lighthouse.

AT Croydon Aerodrome, England, they are using a lighthouse on wheels as pictured here. It is arranged to give a bright central control beam with another wider and less brilliant beam surrounding it.

This lighthouse is moved about the field on its truck for guiding night landings and take-offs, its position being determined by the direction of the wind. The checkered flag indicates the direction of the wind.

How Much per Pound?

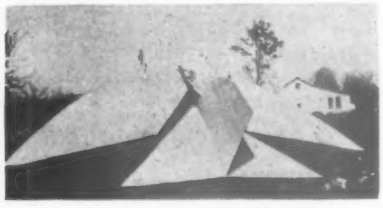
HOW much is a pound? In airplane construction, according to Col. V. E. Clark of the American Airplane & Engine Company, a pound is $90.

"Assuming that a commercial transport plane has an average useful life of 500,000 miles," Col. Clark says, "and a revenue of 3.6 cents per mile for each 200 pound-miles, or $.00018 per pound-mile of allowable payload, then one pound of weight would be represented by the following equation: "500,000 × $.00018 = $90.00."

And They're Still At It

HERE is a rear view of a man powered ornithopter or flapping wing machine devised by Willard Blain, New London, Conn. It has a span of 22 feet and only weighs 40 pounds.

It is intended to be flown by muscular effort, the wings being flapped by the arms of the pilot who lies horizontally in the central portion of the machine. The tail group is controlled by his legs.



Can he take-off with this?

A New Radio Beacon

THE Aeronautical Division of the U. S. Army has purchased a portable sight and sound radio beacon from the Westinghouse Electric and Manufacturing Company. This beacon is part of the Air Corps' extensive experimental program to perfect equipment for blind landing.

The portable apparatus will operate in conjunction with the main beacon which locates the airport to the pilot while the portable unit locates the runway. The portability of the equipment permits the choice of the best runway for the conditions at the field at the time of the arrival of the plane.

The transmitters, loop assembly and the gas engine generator unit are to be located on one truck, the power plant near the front. The transmitter and the loops will extend from the rear with the position of the loops so that when driving the truck into the wind the position of the radio beam will be right for landing into the wind.

The transmitter is capable of sending out signals for use with either the hearing or visual type of beacon receiver. For the sound type, a 720 cycle tone modulation is placed on the carrier. The output to one loop is set to send out the letter "A"—and the other loop sends out the letter "N"—. Other suitable characters may also be used by changing the keying unit. The time relation between the two characters is such that if the plane is on the course the two characters interlock and only a long dash is heard. Position to the right or left of the beam gives a signal in which one of the characters predominate.

In the visual type of transmission, the carrier of one loop is modulated with 65 cycles and the carrier of the other loop modulated with 86 2/3 cycles. If the plane is on the course, the two signal strengths are equal and if the output of the beacon receiver is applied to a reed indicator, both reeds show the same amplitude of vibration. If to one side or the other of the course, the amplitude of vibration of one reed is greater than the other and indicates which side the plane is off the course. In some cases direct reading instruments are used instead of the reed indicator.

The transmitter, rated at 100 watts per loop over a frequency range of 225 to 375 Kcs, is mounted on a single spring supported frame to protect it against shock during transportation. Tests have indicated that a range of 15 to 25 miles may be expected.

The loops are collapsible and made of treated maple, mycalex insulated. They are mounted very close to the transmitter and are made a part of the power amplifier tank circuits to eliminate need for coupling circuit and additional tuning circuit. This increases the efficiency slightly and simplifies the control. To minimize coupling between the two loops, the leads

(*Continued on page* 334)

Combination Automobile and Plane

He can roll or fly—just as he wishes.

THIS is the "aeromobile", a German invention in which the functions of an airplane and automobile are combined. When acting the part of an automobile, the wings are folded up as shown, and when the wings are unfolded, it is said that it quickly becomes a speedy lightplane.

Camels Help Mailplane

A CAPE-TO-CAIRO airmail plane had the unusual experience of receiving aid from the camel, ancient ship of the desert, in the rocky hills of Wadihalfa, Egypt, recently. Camels were loaded with cans of gasoline and trekked to the stranded airplane, which then was able to continue on with its mail and passengers.

Randolph Field Graduates

THIS is the first class of student flyers to complete the basic flying school course at Randolph Field, the West Point of the air, constructed in San Antonio in 1931. Upon graduation from the primary flying school at Randolph, the students were sent to Kelly for the final four months' training. Flying in formation in the aerial review were 32 pursuit planes, 18 observation ships, 24 bombardment planes and 22 attack planes.

Here are the primary school graduates at Randolph field.

A Page of Practical Mechanics

Brevities of practical use for the amateur mechanic and experimenter who like to tinker.

This Candelabra is Simple but Beautiful

THE small, ornate fixture for the modern home is one of the best bets for the home shop fan if he is looking for salable ideas for spare-time profits. To begin with, this unusual clover and lily candle shelf is just the thing to make for your own home; and if you wish, you can make others to sell.

Requiring but two pieces of walnut veneer and three small turned cups of walnut for the candles, this project can be made in an evening. The cups can best be turned from scrap walnut (such as an old table leg) on a small screw center face plate. This attaches to the live center of the lathe and the piece to be turned is merely screwed onto the face plate. This permits setting the tool rest around at right angles to the open end for easy cutting of the cup proper, insuring neat work and accurate dimensions. The cups should fit the large end of any attractive candle.

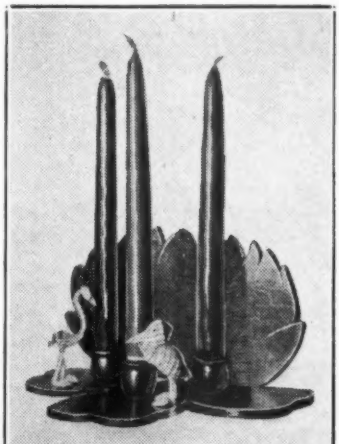
Next, lay out the patterns of the clover leaf shelf, and the water lily flower on a piece of veneer walnut either 1/4 inch or 5/16 inch thick. These can be cut out on your band saw or jig saw. Note that the cuts are continued on the lily outline for some distance. After the cutting, the deception can be carried even farther by cutting shallow lines with the point of a sharp knife as indicated and as the photo shows.

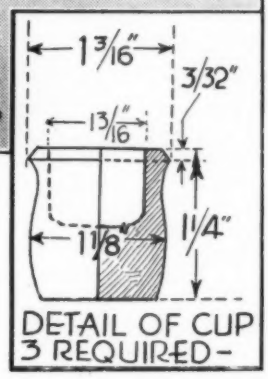
Above. The completed job. At the right. A detail of the candle cup.

Sand all edges to remove the saw teeth marks, then rub a good wood filler into the surfaces of the shelf and the front of the back, and all exposed edges. Remove the surplus with a coarse rag and lay the pieces away for four hours to dry. Then burnish on a spindle covered with several layers of white cloth, placed in the lathe. This saves a lot of hand work and puts a polish on the wood surfaces.

The pieces are now ready to finish. Rub on walnut stain with a rag as this makes it easy to darken any light portions and prevents making other portions too dark. Then rub off any surplus or hold the piece lightly against the burnishing spindle in the lathe. This done, apply a coat of clear lacquer with a good brush as evenly as possible, rather well brushed out. Lay them away to dry for ten minutes (or until just past the tacky stage). Now if you commence to rub down on the cloth covered spindle you can work the surface out to a lovely smooth finish and with considerable luster. Care must be taken, however, to prevent rubbing too hard or too long in one place as heat will soften the lacquer and cause it to run. A little practice on a piece of scrap will be worth while.

In the same manner finish the cups after they have been turned and sanded. Stain to suit, after filler has been applied and rubbed smooth. Then apply lacquer and lightly rub to a satiny finish.





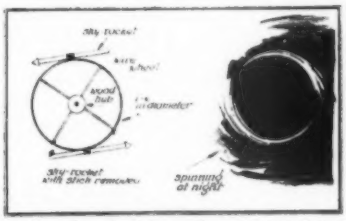
To assemble, set the lily on top of the back edge of the clover leaf, turn upside down and fasten with best quality liquid glue and ¾-inch brads. To insure having the glue stick roughen the surfaces which adjoin with sandpaper or by scraping with the point of a knife.

Finally, bore holes for the cups so they are similarly spaced, not far from the back panel.

Fireworks Display

A SPECTACLE, quite unusual and far more exciting than the pinwheel fireworks, can be made from two small skyrockets and a light wheel made of wire. The rockets are tied to the rim, equidistantly spaced. Two persons ignite the two fuses at the same time. With the rockets both pointing in the same direction, a terrific commotion will follow until the rockets have burned out. The empty tubes can be taken off and two more rockets put on.

Make the wheel by cutting out a circular block of wood. Bore a hole through the center and make nail holes to the center on four sides. Cut four pieces of stiff wire ten inches long. Insert the pieces in the holes, then bend a circle of more stiff wire eighteen inches in diameter and wrap the wire ends about the rim, as shown.



How the pin wheel is made and how it looks in operation.

When finished the spokes will not be able to come out.

Mount the wheel on the side of a tree by driving a long spike through the wheel center into the tree, or attach a block with wire or cord and drive the spike into it. In fact, unless there is a decided hump on the tree, this block will be necessary to prevent the wheel rubbing when in motion.

Cut off the sticks on the rockets then attach them with a soft copper wire with half the wheel between them. It is important that both fuses be lit at the same time. The copper wire can be used over and over.

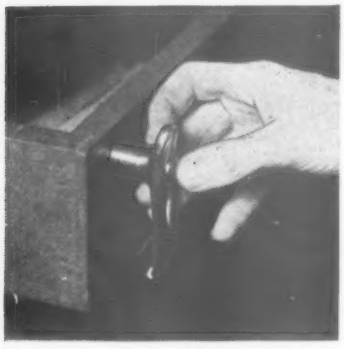
Roman candles can be used in the same way, although the wheel then should be mounted on top of a post and a wide area allowed between the exhibit and the spectators. The wheel will then speed up with jerks and sudden spurts as the balls of fire are thrown out.

There is, however, one precaution that must be observed, and this is, the nail forming the axis must be firmly driven into the post when ready to run. If the nail should fall out of place, or loosen up, the pinwheel would be likely to run amuck among the spectators and cause trouble. A rocket or roman candle contains a lot of powder, enough to cause serious burns if allowed to roll along the ground.

XUM

Broken Car Handles

THE next time someone breaks the handles of your automobile doors trying to get inside, do not throw them away when you have new ones installed. Such old handles, after rough edges have been filed smooth and bolts have been provided for fastening, make



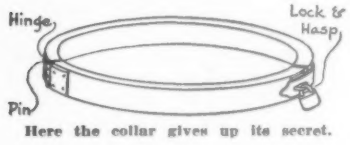
Broken car handles make fine drawer pulls as will be seen above.

strong and comfortable drawer pulls or door handles. Such an arrangement for a swinging drawer is shown in the photograph. It is strong enough to overcome any sticking of the drawer. Closed-car door handles can be obtained from any junk dealer handling automobile parts.

Collar Tricks

HERE IS a simple trick that is sure to puzzle your friends. Take two pieces of brass, and bend them to form a collar. The brass should be about an eighth of an inch thick and an inch wide. Put a small hinge on one joint and a hasp and staple on the other. Use a small padlock to fasten the collar around the neck.

Ask someone to place the collar around your neck and fasten the padlock. The key is laid on a convenient



Here the collar gives up its secret.

table for all to see. The lights are turned out for a few seconds, and a moment or two later the collar is heard to fall on the floor. On inspection it is found that the padlock is still in place.

The explanation is simple. The hinge is a tight-pin hinge, but the pin has been removed and filed until it is small enough to come out when pulled by one end. However, it is tight when the average person who does not know of the trick examines it.

This is similar to one of the tricks performed by Houdini, the celebrated "hand-cuff king." But while it is simple, it requires a considerable amount of practice.

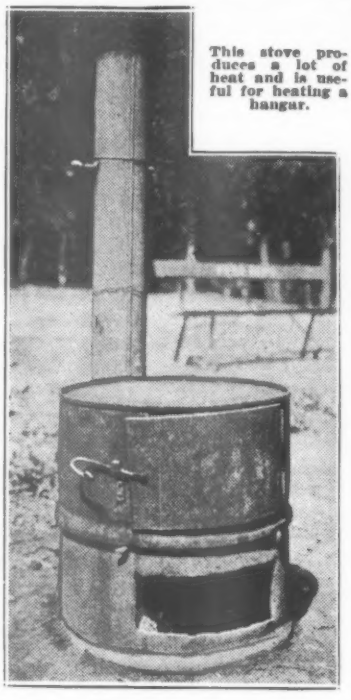
You May Need This Stove This Winter

AN empty 50-gallon oil or gasoline barrel makes one of the best possible stoves for the public camp or park that can be provided. Aside from the low cost and ease of alteration, the stove takes up but little area and will last for a number of seasons without any repair. Being useless for anything else, there is no danger of theft during the winter.

Two holes are cut in one side of the drum and these can be provided with doors or left open. Two sections of stovepipe are needed and these are attached to a small hole in the back with a damper near the top of the flue. The barrels are sunk 12 inches in the ground and the earth thrown back in flush with the rest of the ground, providing anchorage.

Since the door openings can best be cut with a torch, care must be taken that the contents are entirely removed before starting the cutting, if the barrel contained gasoline.

A great improvement can be made, if you are in the humor for tinkering with the stove, by using grates. These can be made of iron rods or even metal lath scrap, and they greatly improve the draft and the amount of heat.



This stove produces a lot of heat and is useful for heating a hangar.

It's Easy to Make This Magazine Rack

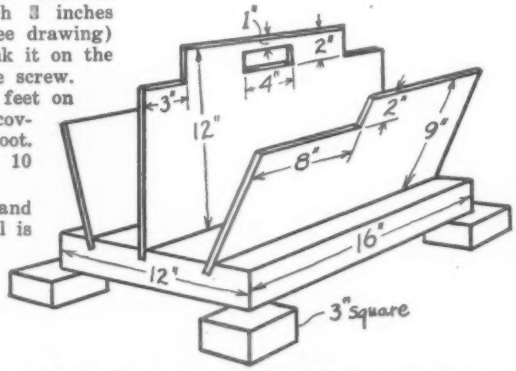
OUT of an old plank and a few odd pieces of plywood, or perhaps the sides of an apple crate, you can make a very attractive modernistic magazine rack.

For the base you will need a piece of hard wood 1½ inches thick, 16 inches long and 12 inches wide. A well seasoned piece of soft wood will do, but is likely to warp or crack. Dress this to size and cut the dados. Be sure the outside ones are of the proper angle. If you have a circular saw with a tilting table the job will be simple. Otherwise it must be done with a mallet and chisel.

For the feet, a piece of the same wood 3 inches thick and about 13 inches long will be needed. Cut this up into four blocks, each 3 inches square. In one corner (see drawing) drill a hole and countersink it on the bottom. This will hold the screw. Sand well and mount the feet on the base, so that the base covers one-quarter of each foot. Use good glue and No. 10 screws 2½ inches long.

For the center board and the sides, the best material is ⅝ inch, 5-plywood. Of course, you can use other wood; the sides of apple boxes, if they are sound and not cracked, will answer the purpose well. Cut them to shape and set in the dados cut in the base. If the sides do not fit well use files and chisels until they do. Before setting them in place be sure that the base is well sanded, for it is hard to do a good job of sand papering after the parts have been assembled.

The finish depends upon the wood used. If it is good hard wood, or any of the good cabinet woods, an excellent job can be made with stain and shellac. If cheap or soft wood has been used, paint or lacquer should be used. The paint or lacquer seals up the wood better than varnish or shellac and prevents warping.



An isometric view of the assembled magazine rack which has a considerable space for storing the "mags".

What Our Readers Are Building

A department devoted to our readers' activities in airplane, glider and engine construction, showing the latest developments in the amateur field.

We're Coming Along Great

WELL, our last appeal must have reached your hearts, for the letters have been coming in fine, and most of them are mighty good material for this department.

However, we mustn't rest too long on our laurels, or the next thing we know, we'll be running short again. So just keep them rolling in, boys. You can do it if you'll take the time. We've managed to keep the home fires burning for some months, and if we can do this, it's a cinch that we can continue indefinitely.

He Builds a Hang-Glider

Floyd Ryan about to take-off in his hang-glider.

FLOYD RYAN, Jr., Dalton, N. Y., is 16 years of age and has been building gliders for six years. This is a most noteworthy accomplishment—nearly a record breaker as a matter of fact.

He has sent us the accompanying photo of his latest production, a hang-type glider which appears to be a well designed and constructed job. He says that it has such a slow flying speed that it will take-off and land in a very short distance and that it will carry two persons for short hops when towed. Since this picture was taken, ailerons have been fitted to it.

The hang-glider has a span of 24 feet, a chord of five feet and weighs 65 pounds. With its great area and light weight, its slow flying speed is self-apparent.

Kansas City Enters a Beautiful Job

This is the "Wyandotte Pup" an unusually good looking amateur cabin job. Read about it below.

HERE we have a beautiful ship, built by the aviation class of Wyandotte High School, Kansas City, Kansas, under the direction of Guy F. House, the instructor in aviation. Mr. House has very kindly written to us about the ship and has provided the accompanying photographs. After carefully examining the photographs it is difficult to believe that this ship was built by students and we congratulate them upon their success.

Mr. House writes the following description:

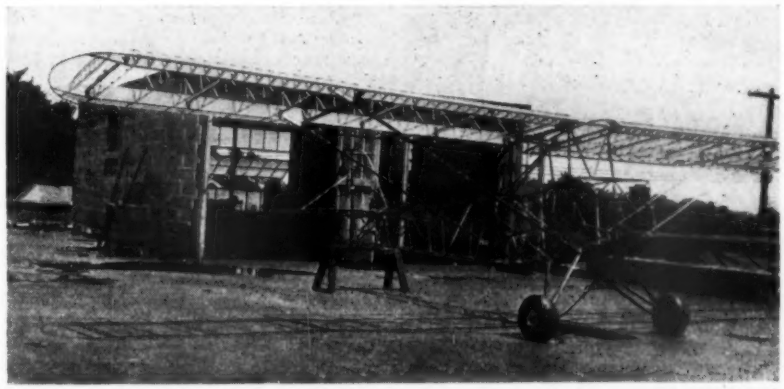
The aviation classes were inaugurated in the Fall of 1928 and the initiative of that beginning class is shown in the achievement of this year's class. The honor of testing the "Wyandotte Pup", the first plane ever designed and built in a high-school in the U. S. A., belongs to Mr. Ralph Hall, a member of that first class of 1928. Mr. Hall now holds a transport pilot's license, and his age—well, he will vote for president for the first time this fall.

The "Wyandotte Pup" was designed by three men and each detail of construction was fully discussed in the class-room before construction was actually started. Thus, the students had a part in the original plans and final construction. The construction was started April 1st and the ship was test flown August 18th.

These three men, who first planned to qualify the plane for an approved type certificate, and who later intend to manufacture similar planes in an organized factory, are: Guy F. House, Instructor in aviation, Wyandotte High-School; Fred J. Stevenson, pioneer Chicago aircraft builder and Noel Hockaday, master mechanic and welder, formerly with the Laird Airplane Company.

After the final plans were drawn up, they were submitted to an aircraft engineer for approval and stress analysis. While the line-up with these two experienced men may appear to place

(Continued on page 334)



Here's the "Wyandotte Pup" before it was covered, a view that will let you into the internal secrets.

Here is an Amateur Plane From Oregon

A Heath Parasol, built by Stewart and Manley, that has shown good performance in its test flights.

AND now we introduce a partnership job from the West coast. It is a Heath H-200 two-place plane built by B. B. Stewart and F. E. Manly, 1225 N. 11th St., Salem, Oregon, both of whom are beginners. Together, they spent about two years on the construction but the time has been well spent to judge from the gratifying results that they have obtained.

The ship is powered by a Model "A" Ford engine, converted after their own ideas and the landing gear was changed from the original design. The wing span is 35 feet, with a six foot chord and an M-12 wing section.

Concerning the performance, they write the following notes:

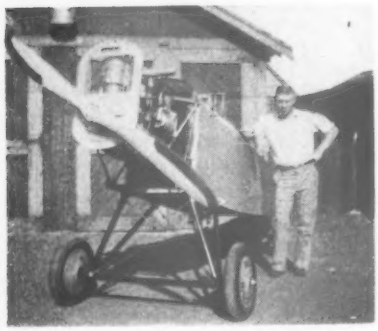
This ship was test flown by Lee W. Eyerly of the Eyerly Aircraft Corporation. He took it up to 2,200 feet, stalled it, banked it around and power dived it. It acted very well, flying with hands off and did not show any weakness.

My partner and I do not know how to fly, but intend to take instructions as soon as possible.

We do say that you have a mighty fine magazine and we got a lot of good information out of it during the construction of our ship. We did not have anything but the blueprints to build it by and had no previous experience.

Well, this is certainly a fine job, if a test flight by Lee Eyerly means anything—and it certainly does. A set of blue-prints, copies of POPULAR AVIATION and a lot of ambition were the total visible assets in the venture.

Bert Backstein's Ship



Bert and his ship.

BERT BACKSTEIN, an old friend of this department has sent this picture of himself and the ship. Fine, Bert, but where are the wings?

We would like to have some data on the plane, dimensions, weights and performance. We trust that he has succeeded in getting an O. K. on the job from the inspection department.

Reduction of Flying Noises

THE United States Bureau of Standards, in its investigation of the noises of flight, has found that propeller sounds are exceptionally difficult to deal with. However, with a wider adaption of the slower moving geared propeller, and with motor muffling, much of the annoyance of the roar of flight may be eliminated.

An eastern transport company has equipped all its passenger planes with a motor muffling device which reduces engine noise about 70 per cent and at the same time obtains a reduction of about one-third in back pressure.

Dry Ice for Dural

A SIX weeks' experiment conducted in the use of dry ice refrigeration as a method of arresting the aging of duralumin, has been concluded with successful results, according to engineers. They state the tests have demonstrated a material saving of time and expense in this phase of airplane manufacture.

Don't Overfill the Tank

THIS cold weather safety hint may reach amateur fliers too late for practical application this winter, but it is a good thing to remember during the winters that are coming. Do not fill gasoline tanks to the limit in cold weather because when an airplane is brought into a warm hangar the gasoline will expand and overflow through the vents. A 50-degree difference in temperature will cause an expansion of about two and one-half gallons in each 100.

Two Berwyn Amateurs

HENRY PECINA, 1920 S. Cuyler Ave., Berwyn, Ill., and a few of his friends are making their own lightplane. Times are hard—so we have heard somewhere—and the boys are trying to raise the money for the plane by making over Ford engines and selling them.

The engines are designed to fly a 2-place lightplane, weighing not more than 800 pounds empty. They hang a special manifold, and a good ignition system on the regular engine. Oh! Yes, and a lot of other little things.

Henry visited at our office and told us all about it. It listens well, and we pass the info' along to you all. If you are interested, drop him a line.

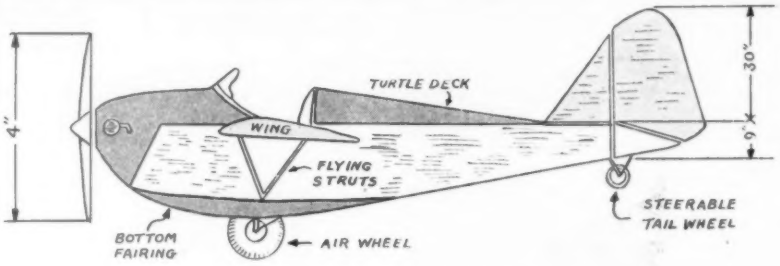
Two Chicagoans Report

THESE two boys from Chicago have constructed the plane shown here, but as they forgot their names and address, they will remain nameless—at least in this issue. We wish that they had sent us a picture of the whole plane and some useful data that would have been of interest to our readers.

They are tuning up the engine—looks familiar.

IDEAS FOR A HEDGEHOPPER

By Manley Mills



Side Elevation of the Mono-wheel hedgehopper.

THE only way to learn to fly is by flying, but there is no doubt that preliminary practice in using the controls helps to shorten the time required for dual instruction in the air. In other words, the more you know about the feel of flying before taking actual flight instruction, the quicker you learn to fly.

That fact has long been realized by flying instructors, and as a result, many ingenious devices have been designed for the purpose of furnishing practice in the manipulation of the controls. The Ruggles Orientator used by our government is, perhaps, the best known.

During the World War, when pilots had to be trained in a hurry, the student usually began his training by taxiing around in a clipped-wing plane, called a "Penguin", which could not leave the ground. When he became skilled in handling the elevator and rudder controls, he was then promoted to a ship capable of short hops, with a slightly more powerful motor and greater wing area.

According to the approved method of glider flying instruction, the first stage of training consists of heading the glider into the wind and practicing until you are able to keep the glider balanced on the skid by working the ailerons. Then, when actual flights are made, you will already have experience in maintaining lateral control.

However, of all the methods devised thus far, few have provided the sensation of flying and permitted the use of all controls as well as the throttle. Furthermore, most of these devices have been far too expensive to be practical for the average flying student.

My mono-wheel trainer has been designed with the above facts in mind. It makes full use of all the controls and flight principles of the conventional airplane, and it would come as near to giving the sensation of flying as is possible for a machine that does not leave the ground.

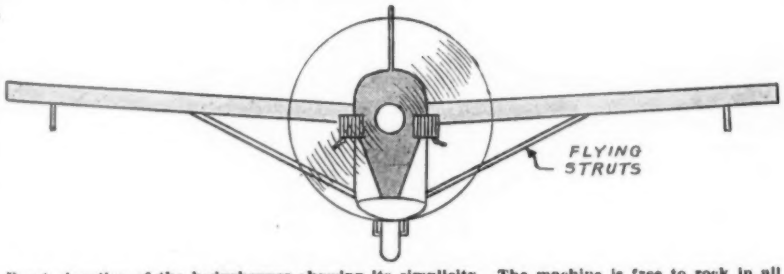
As far as the ordinary airplane is concerned, the one-wheel landing gear is not new. Over twenty years ago, the old R. E. P. monoplane was so equipped. A single wheel was located under the front part of the fuselage on a bicycle type fork and an auxiliary wheel was attached to each wing-tip. More recently, there is the Loening mono-wheel landing gear and the many types of one-wheel gear found on sailplanes and power gliders.

The single wheel idea is particularly well suited to the ground trainer, because it acts as a sort of universal joint, giving the student the opportunity of using all the controls for the same purpose they are intended for on a large plane. When the machine is in action, the wings will support part of the weight—most of it in fact, at full speed.

The soft air-wheel, mounted on shock-absorbers for added resiliency, will help the wings create a floating effect or sense of buoyancy similar to that of actual flight.

Such training machines can be constructed to sell at a very low cost, not requiring the high quality engineering and materials necessary for a large plane. There are several small glider motors on the market that would be admirably suited for a power plant.

An engine of five or ten horsepower would give the machine a breath-taking speed—it would be so light and its resistance so low. In addition to providing training, it furnishes exhilarating sport.



Front elevation of the hedgehopper showing its simplicity. The machine is free to rock in all directions about the single wheel so that all three planes of balance are available.

BARTER AND EXCHANGE

If you have anything that you wish to trade, send in your wants to POPULAR AVIATION, Barter and Exchange Department, 608 S. Dearborn St., Chicago, Ill. The service is free, but the publishers reserve the right to reject any and all notices that are contrary to the policy of the magazine.

WILL EXCHANGE good clear 8" x 10" photos of modern planes for a copy of Aircraft Mechanic's Handbook.—Charles Underwood, 6227 Byron St., Chicago, Ill.

A CONVERTED Maytag Washing Machine Motor, suitable for driving a large Model plane, will be exchanged for a correspondence course in aeronautics.—J. L. Rawlings, 6227 Byron St., Chicago, Ill.

PARTNER WANTED. I have a lightplane but no engine. Will go into partnership with anyone having a 30 h.p. or 40 h.p. engine for this ship.—Fred Quick, 408 S. McClun St., Bloomington, Ill.

REPORTS OF 1915-1918-1919-1920-1923-1924-1926-1927 National Advisory Committee for Aeronautics. Will pay cash for these volumes—quote prices.—Louis L. Brandes, 1323 First Avenue, South, Fargo, N. D.

A Flying Yacht

THE Junkers plant in Germany proposes making a flying yacht for an American millionaire. To the smallest detail, the airplane (a monoplane) will be completely and comfortably furnished for business and travel.

Special light weight furniture has been designed. The office equipment is complete, making it possible for the owner to conduct his business while flying. Short-wave radio equipment permits telephonic connection to any point in the world.

In spite of the limited space in the plane, the equipment is very complete. In the rear is a luggage and general storage compartment. Forward is a neat sitting-room, complete with chairs, a table and a bureau. The section just forward of the sitting-room is the bedroom. A double deck bunk provides sleeping arrangements. A chest of drawers is located on the right side of the cabin.

Forward of the bedroom is the office. Considering the small space, a more pefectly equipped room is hard to imagine. Strong light weight metal has been used for the furniture. A well known American manufacturer has constructed a special light-weight typewriter, especially for this flying office.

Other arrangements include sanitary conveniences, a small commissary department and pilots' quarters in the extreme forward part of the ship. The monoplane is an all metal job with a large cruising radius.

BOUND VOLUMES OF P. A.

We have a few bound volumes of POPULAR AVIATION for sale, bound in leather and in good condition. Price $7.50 per volume. Aug. 1927 to June 1928; 1928 and 1929.

POPULAR AVIATION

608 S. Dearborn St., Chicago, Ill.

POPULAR AVIATION FIRST INTERNATIONAL MODEL AIRPLANE CONTEST

Our window exhibit of models and contest prizes, attracts much attention. It is located at the S.W. corner of Dearborn and Harrison Sts., Chicago.

81 Prizes Offered in Popular Aviation International Model Contest

GRAND PRIZE
FOR BEST ALL-ROUND MODEL
A beautiful Victory Colonnade standing 32 inches high as shown in accompanying illustration.

DIVISIONAL PRIZES

The following prizes are offered under each of the four divisions provided in the contest. (1) Flying Scale Model Event, (2) Non-Flying Scale Model Event, (3) Stick Model Event, (4) Most Original Design Model Event.

1st Prize. Trophy Cup.
2nd Prize. Pedestal, with airplane on globe.
3rd Prize. Beautiful Plaque Trophy.
4th-10th Prizes. Medals of honor.
11th-20th Prizes. One year's subscription to POPULAR AVIATION.

also, 10 honorable mentions in each division

One Grand Prize — 80 Divisional Prizes in All

MODEL Fans, all over the country, have shown their interest and approval of the First POPULAR AVIATION International Airplane Model Contest, announced in our October issue.

With the prospect of winning one of the 81 beautiful prizes offered by POPULAR AVIATION, our readers immediately got busy and either entered the photograph of a present model or started in on the construction of a new special model.

Just nine days after the October issue left the printer's hands, we received our first entry from Whitney Snow, Hollis, N. Y. The second entry of Burton Kemp, St. Louis, Mo., quickly followed and from this time on, we have been receiving photographs of the splendid models built by our readers. We felt sure, at the start, that the contest would be popular with our readers, but the actual response exceeded our fondest expectations.

And now, while we are mighty glad to see this quick response, and to get the photos as quickly as possible, yet we wish to inform everybody that they stand just as much show in the contest as these early birds. Your model will be judged strictly upon its merits, and the date of the entry will have nothing at all in the award of prizes, provided that we receive the entry before December 31, 1932. But why wait until the last minute?

If you have read the October issue of POPULAR AVIATION, you will understand the conditions of the contest and how you can enter it, but for the benefit of those who did not get this issue, we will repeat the essential points before going on with the rest of the story.

First, last and all the time, this contest is open to all of our readers without any restrictions whatever. It makes no difference whether your age is seven years or 70, you're eligible for one of the beautiful prizes. And it doesn't make any difference whether you come from Chicago, San Francisco, London or Singapore, you are entitled to compete. There are no class restrictions and the rules are few and simple.

First of all, you send in a good, clear photograph of your model. A good, sharp, clean snapshot will do. Then you fill out the coupon placed here for your convenience and paste it on the back of the photo, or else write the same information on the back of the photograph—it makes no difference. However, we must have all the points of information given by the coupon. BUT DON'T—DON'T SEND THE MODEL UNTIL WE ASK FOR IT.

A few of the 81 prizes on display.

After we have examined all of the photographs, the editorial staff of P. A. will pick out the probable prize winners and will then ask you to send your model to us for closer inspection. But for your own sake and ours, DON'T SEND THE MODEL until it is requested. With the original models before them, the staff will then pronounce final judgment and will award the prizes accordingly. This is mighty plain, easy and simple.

In order to give every class of model a chance at a prize, we have divided the models into four different divisions, and you can enter as many models as you wish under any or all of these four classes. These divisions are as follows: (1) Flying Scale Models, (2) Non-flying Scale Models, (3) Any type of flying-stick or non-scale model, (4) Original Design or Freak Models of an unusual type of aircraft, such as a rotor ship, Autogiro, helicopter, dirigible, etc. Mark the coupon or the photograph plainly with the class number in which the model is to be entered.

Now, this contest is different in many respects from any contest held up to this time. In the first place, our purpose in organizing the contest is to develope design, workmanship and originality rather than flying ability. It encourages care and skill rather than flying time or distance, but at the same time it should be noted that models entered under classes (1), (3) and (4) must be able to fly to some extent.

All of the scale-models must be exact small-scale copies of the large ship from which they are named. They must be finished just as well as you know how to finish the model and must be complete down to the smallest detail. In the following, are the most important points to consider in building your model.

IMPORTANT POINTS

1. Careful workmanship, well constructed models.

2. Faithfulness to detail, the more detail in regard to such accessories as

How to Enter the Model Contest

1. *Take one or more good photographs of your model or models.*
2. *Fill out the coupon, or a facsimile of same, giving name, address and classification under which you wish the model to be entered.*
3. *Paste a coupon, or facsimile, or write out the information on the back of each photograph and send them to POPULAR AVIATION, Model Contest, 608 S. Dearborn St., Chicago, Ill.*
4. *Please do not send a letter with the photos, nor ask us questions as to the progress of the contest. All such information will be found in succeeding issues of POPULAR AVIATION.*
5. *THIS CONTEST CLOSES DECEMBER 31, 1932.*
6. *As soon after Dec. 31, 1932 as possible, the 81 winning contestants will be asked to ship their finished model to Chicago where a group of expert judges will decide prize winners by a personal examination of the actual models.*

landing gears, control surfaces, etc., in the scale models, the more likely will be your model to receive a prize.

3. Beauty of finish is an important point, so take care to paint or varnish the model with great care.

4. Truth to scale or proportions in the scale models.

And now for the prizes. These prizes, described elsewhere, are well worth your time and best effort. In fact they are comparable with the trophies awarded for full size events at the air meets and will long stand to remind you of your ability as a model builder. We spent a lot of time in making this selection and you will be proud to see your name engraved upon one of these awards.

It is important to note that there are 20 worthwhile prizes under each of the four classes of models, or 80 group prizes in all. And then to cap the climax, there is one magnificent Grand Prize to be awarded for the best all around model, regardless of class. This is a beautiful colonnade standing 32 inches high. The first prize under each of the four divisions is a large trophy cup, the second prize is a beautiful metal mounted plaque and then follow the 17 remaining prizes under each class consisting of medals or subscriptions to POPULAR AVIATION. To receive a full year's subscription is well worth trying for, alone, although the subscriptions rank among the last ten prizes is each group.

And now we will attend to the many questions that have been asked in respect to certain points in the contest. We thought that it would be better to print these questions and answers for the benefit of all rather than to make direct reply by letter. These points will be explained as follows:

Replies to Correspondents

A. A. F., Grand Rapids, Mich. If I make a scale model of a Corsair in Classes No. 1 or No. 2, is it necessary for me to send a blue print of the large ship with the model?

ANSWER. No. We have sufficient data here at the office for this purpose, so don't send the full size blue print.

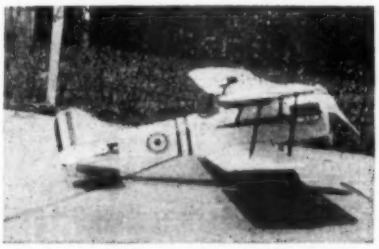
* * *

J. B. McC., St. Louis, Mo. Do we get our models back after we send them to you for the final examination?

ANSWER. Yes, you bet you do. As soon as we judge the models, they will be immediately returned to you.

* * *

G. R. T., Chicago, Ill. How big must the model be? Is a 24-inch model big enough, or is it too big?



Here is our first model-contest entry, an "S.E.5" submitted by Whitney Snow of Hollis, N. Y.

ANSWER. As we stated in the October issue, there is no limit to the size—you can make them as big or little as you wish.

* * *

S. S. McD., Salt Lake City, Utah. I am thinking of entering a compressed air model. What class does this come under?

ANSWER. Compressed-air planes, gasoline engined planes, planes with rocket power or gunpowder motors all fall under Class No. 4.

* * *

K. L. B., Rockford, Ill. Must we make all the parts ourselves, including fittings, propellers, etc? Are kit-sets barred from the contest?

ANSWER. It makes no difference to us whether you buy or make the various parts of the models. It's the final appearance of the whole assembled job that counts with us. Models made from kit-sets are not barred, and why should they be, for a kit-set is simply a time saving collection of material that is obtainable at a fairly low price. It's the way that you use the materials that counts.

* * *

D. E. F., Butler, Pa. Can the non-flying scale models be carved out of solid wood?

ANSWER. Yes. It makes no difference what material you use for this class of model.

* * *

J. G. F. I am 65 years young, but still am a rabid model enthusiast, going in strong for non-flying scale models. Does my white hair bar me out of my favorite pastime?

ANSWER. Come in, the water's fine. When we say that there are no limits, we mean it. Hope to see your model.

* * *

H. H. K., Springfield, Mass. I am a transport pilot with 8,750 airhours to my credit, but am a model fiend just the same. Do I get a show-in in this contest, or am I "professional?"

ANSWER. Come right in, H. H. K., and don't think that you will have a walk-over, either, for some of these young boys are mighty clever at this sort of thing.

* * *

M. D. S., Norfolk, Va. I have two

Col. Clarke and his collection of scale models. This picture demonstrates our point that the oldsters as well as the youngsters are adepts at model building.

The following information must appear complete on the back of every model photograph submitted in this contest. This entry blank is printed for your convenience to paste on the back of photographs, but is not required so long as the information is filled out on the back of each photograph.

POPULAR AVIATION FIRST INTERNATIONAL

MODEL AIRPLANE CONTEST

608 South Dearborn St. Chicago, Ill.

Please enter this photograph in the division checked:
Flying ☐ Non-Flying ☐ Stick ☐ Freak Design ☐

Name .....

Street or R. F. D. .....

City ..... *State* .....

models made up that I would like to enter, but can't decide which one is best. Can I enter both of them?

ANSWER. Enter both of them under their proper classification, and then make a third model if you wish. There is no limit to the number that can be entered by one contestant.

* * *

F. S. D., Lincoln, Neb. Say that I have two models, both equally well built and finished, but one of them flies much better than the other. Would you give a prize to the poorer flyer if it struck your fancy?

ANSWER. This is not a flying contest, so that we would not be influenced by flying ability.

* * *

C. C. G., Portland, Me. How much does it cost to enter the contest?

ANSWER. There is no entrance fee—it's free. Except for the materials, the cost of the photograph and the prepayment of the express charges, there is no expense connected with the contest. It's a regular Scotch picnic.

* * *

S. N. M., Webster City, Ia. Is it necessary to build the contest models from the plans appearing in POPULAR AVIATION*?*

ANSWER. No. It makes no difference where you get the plans, either from this magazine or elsewhere.

* * *

E. D. R., Detroit, Mich. If you have only a photograph of the models, how do you expect to judge workmanship and finish?

ANSWER. Many models are built so roughly and crudely that it is a simple matter to tell them in a photograph and it is easy to eliminate the obviously unfit models. When we get photographs showing good proportions, apparent fidelity to the original, and similar points, we will call this model in for direct examination. Any model that looks at all like a good job from the photograph will be called in.

* * *

F. C. S., Pittsburgh, Pa. I have built a small model gasoline engine of the radial type that actually works. It is a three-cylinder radial with a ½" x ½" bore and stroke. Under what class—if any—can this be entered?

ANSWER. Sorry, but there is no class for this engine. If we were sure that there would be a few engine entries, we would create another class for we are keen on model engines.

* * *

W. Y. V., Milwaukee, Wis. Will the models be on display so that I can see them? If so, I'll be glad to take a run down to "Chi" and get an eye full.

ANSWER. We intend to place the winning models on public display at some retail store. The prizes are now on display at the S. W. corner of Harrison and Dearborn Sts., Chicago.

* * *

And thus we settle the questions that have arisen up to this time concerning the contest. If you wish any more information, write in about it.

Photographing Your Model

NOW, getting a good photograph of your model is an important factor in entering the POPULAR AVIATION Contest. The camera should be focused sharp and clear and the proper exposure should be given so that all parts are distinct, with good details in the shadows.

Take two or three pictures if necessary in order to get a good shot.

A background should always be used, preferably a bedsheet or a large piece of white shelf paper, so that there will be nothing showing back of the model that will detract from its detail. If the model is light colored, then use

Taking a picture of the model.

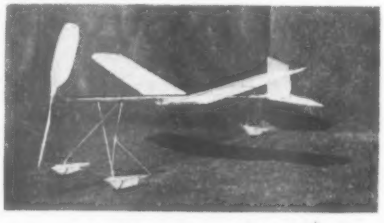
a dark colored background, or a white plain background for a dark colored model.

Try to get the image of the model as large as possible so that it will nearly fill the photo. This means getting your camera close to the model, but take care not to get the camera so close that it is out of focus. As six feet is about as close as it is possible to bring a simple hand-camera, it is advisable to use a "portrait attachment", which will allow the camera to be placed still closer, giving a still larger image of the model.

Please do not have shrubbery, buildings or other objects in the background unless they are at a considerable distance back of the model. Try and get the light so arranged that there will be no shadows on the under part of the model nor on the sheet directly back of the model.

Here's a Young Seaplane

THE subject chosen by Robert E. Loehwing, 666 Slocum Ave., Ridgefield, N. J., was a seaplane, which the picture shows up as a mighty neat little job.



A baby seaplane that flies well.

Builds a Cup Winner

Here a small model wins a big cup.

HERE'S the airplane model built by Frank Loughlin, Woodhaven, N. Y., and the big cup that it won in a scale model contest. It is a replica of the Curtiss Robin—accurately to scale.

Its builder went way down into the fine details, for the model is fully equipped with seats, controls, throttle, doughnut wheels and a door.

Uses Found for Capsules

JOHNNY BURKE (he forgot his address), must have a drug store or work in a hospital for he has sent a

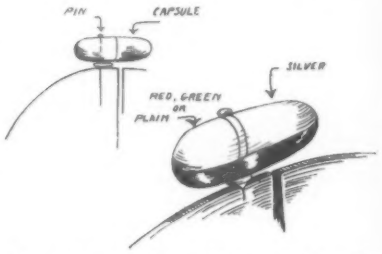


Fig. 1. Details for making wing tip lights from a capsule.

number of ideas showing how to use capsules in model building.

First, in Fig. 1, we see how a capsule can be used for making a wing tip-light. In Fig. 2, he shows how to make a model wind-driven generator from a capsule and a strip of celluloid. He sent us a completed model of the generator and it looked very nifty.

Such details as the light and the generator add tremendously to the appearance of the model, particularly if they are brightly colored.

plain background for a dark colored information, write in about it.

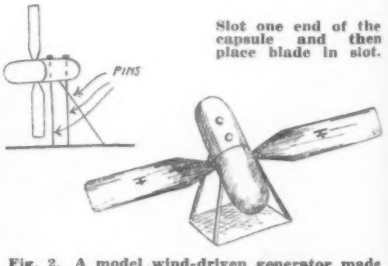


Fig. 2. A model wind-driven generator made of a capsule, pins and celluloid strip.

A Big Frisoli Model

Miss Frisoli and the model.

JOHN FRISOLI, son of the president of the Scientific Airplane Model Company, built this remarkable six-foot monocoupe, which flew for 52 seconds at the recent Scientific Model Meet. Norma Frisoli, sister of the builder, is shown holding the model.

It is reported that the Scientific model meet proved to be a great success, well attended and replete with excellent flights in all of the classes. Many of the models flew so high and so far that they went completely out of sight, thereby making matters very interesting for the judges of the contests.

Winners of the Contest

HERE are the two winners of the Idealocraft-Gimbel Model Contest, L. Hafner (at the left) and George Ehling, both of whom made an excellent score.

This contest, held in New York, awakened a great deal of enthusiasm among the model builders of that city and much credit is due to Mr. Nussbaum, the director, who is also director of the Gimbel Model Aircraft League. The Gimbel League is affiliated with the Airplane Model League of America.

Winners of the Idealocraft-Gimbel Contest.

A Fine Meet at Chicago

ONE of the largest National Outdoor Model Meets staged this year was held in Chicago September 11. This meet, known as the Second National Outdoor Model Airplane Meet, was held for average duration of rubber driven rise-off-ground fuselage models.

Even though the day was clear and sunny the air was very bumpy due to the strong wind which made it hard for some of the model contestants to obtain a high average duration. But in spite of all that, Robert Pekelsma, Chicago, succeeded in making a flight of 463 seconds, or 7 minutes 43 seconds, and obtained an average for his three official flights of 222 seconds or 3 minutes 42 seconds.

This average for three flights is considered a great achievement and for his work he has received the beautiful "Midland Club" trophy. Edward Becvar, Chicago, was placed second with an average for his three official flights, 166.96 seconds and was awarded the Sky Harbor trophy. Mr. Becvar's best flight of the three officials was 420 seconds or 7 minutes flat.

Eugene Svitenky, also of Chicago, was placed third with an average of 114.66 2/3 seconds and for his feat received the Aeronautical Association trophy.

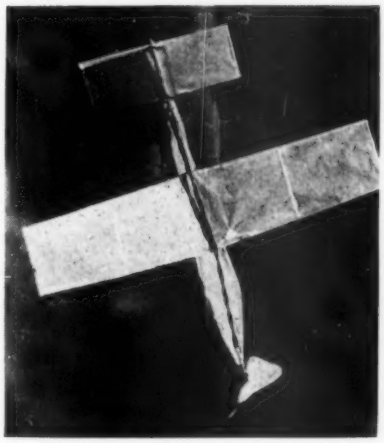
Ruick Myers, Chicago, fourth place, averaged 98.2 seconds.

This is the first National model airplane contest that has ever been held for average duration, the idea being to develop the model airplane to a higher efficiency and greater reliability than those that have been previously flown in other model contests for duration only. This National Average Duration Model Airplane Meet compelled the model flyer to fly his models with greater consistency than he would in single flight duration meets as every one of his flights counts in the average duration for the three official flights.

With regard to the conditions of the contest there were no restrictions of design with the exeption that the model must have a main wing span of 25 inches or more; must weigh (without motive power) ½ ounce or more; must have a main double surface wing (top and bottom); landing chassis with at least ½ inch diameter wheels that turn and the maximum cross sectional area of fuselage must not be less than 1/10 of the overall length of the model squared (same as the International Wakefield rules). Last, the fuselage model must look like a real airplane.

Before the start of the National Model Meet all of the 112 contestants had their models checked and approved and were assigned to their proper squad to take their official flights. Joseph J. Lucas, National Outdoor Model Champion, was director in charge of the meet and Major R. W. Schroeder (former altitude record holder) was referee.

Yes, It is Spaghetti



The model above, believe it or not, is made of spaghetti. Durum paste (rolled spaghetti dough) forms the wings and tubular spaghetti forms the frame.

IN AN exclusive interview granted POPULAR AVIATION, a California inventor says:

"Following exhaustive experiments with models, the latest of which is illustrated herewith, I have just received a patent covering the use of a new material for the construction of airplane frames. Chiefly composed of a dried paste of durum flour, this remarkable composition is more or less commonly known as spaghetti.

"It is my intention to build a gigantic plane for transpacific flying, using a special grade of tubular macaroni throughout. Machinery adapted to the production of this seamless tubing will be available about the first of the year.

"Such use of macaroni will solve the problem of surplus wheat. I have received telegrams from farmers' organizations all over the country, hailing my discovery as the salvation of agriculture.

"Few people are aware of the virtues of this material for airplane construction. Its advantages are many. For instance, to mention only a few: If the plane falls into the ocean, the crew and passengers can subsist for several days by sucking sections of the tubing. The musically inclined can make flutes and whistles from the macaroni, thus beguiling the tedium as they float in the briny.

"Careful calculations reveal that the cost of materials used in my latest model, exclusive of the rubber motor, amounts to $0.0025. I estimate that, purchased in large quantities, macaroni for a plane of the size I contemplate would not exceed $51.37 in cost. I already have received ten per cent of this amount in popular subscriptions."

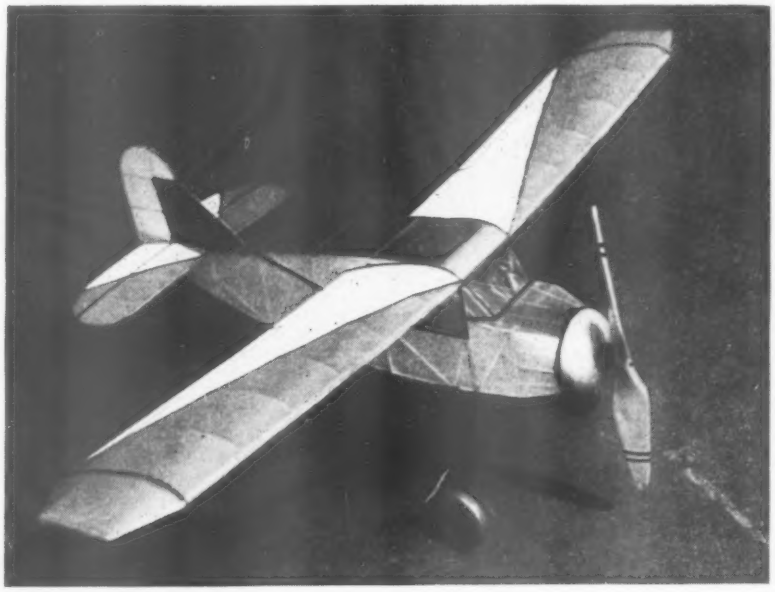
And, besides all these advantages, every one can build the plane right in the kitchen—a kitchen sink job, so to speak. Bakeries and cracker factories will be the producers of airplanes from now on—perhaps.

Building the Bellanca "Sky-Rocket"

by

Joseph S. Ott

Model Editor



A three-quarter front view of the Bellanca-Rocket model—true to scale and yet having good flying qualities.

THE large Bellancas have proven themselves beyond doubt in the commercial field, and this month's article is a reproduction of the famous Skyrocket. The full size Bellancas are known for their extremely high speed and great carrying capacity.

The commercial Skyrocket carries eight to ten passengers using a single 575 horsepower motor and travels at a speed close to 150 miles per hour.

The model has been reproduced to an exact scale and the dimensions have been carried out faithfully in the reduced size. No deviation of any kind has been made with but with one exception. The diameter of the propeller is greater in the reduced scale and this necessitates increasing the height of the landing gear. The proportion of the wing span to the chord is reduced to scale, also the length of the body, the position of the stabilizer, the width of the stabilizer and the proportion of the rudder.

Note on the plan view that the body appears to be very stubby. This gives a proportion wherein the span and chord ratio is increased. No dummy motor is installed nor shown on the photographs but may be added and the additional weight of these parts will put sufficient weight on the nose of the model so that no other weight need be added to balance the model for flying. If the motor is left off, a small lead weight should be put on the lower side of the nose block and as far to the front as possible to balance the tail sections and the long rubber motor.

Materials Required

Propeller—10″—7/8x1″—1.
Longerons—24″—3/32x3/32″—10.
Nose block—2½″—diam. x ¾″—1.
Struts—24″—1/16x3/4″—3.
Spars—24″—1/16x1/8″—4.
Leading edge—24″—1/8x3/16″—2.
Trailing edge—24″—1/16x1/4″—2.
Rib stock—24″—1/16x2½″—2.
Tail units—12″—1/16x1/4″—5.
Landing gear—12″—1/16x1/4″—2.
Motor—60″—1/32x1/8″ rubber—1.
Wheels—1⅞″—Diameter—2.
Shaft—3″—.024 diameter—1.
Washers—1/8″—Brass—3.
Tail wheel—1 inch diameter—1.
Tissue — 20½ x 24½″ — Hakone, green—1.
Tissue — 20½ x 24½″ — Hakone, white—2.
Cement—Large tube—clear—1.
Dope—Large jar—Clear—1.
Lacquer—Small jar—Black—1.

Note the cabin and pilot's look-out construction at the entering edge of the wing.

FUSELAGE CONSTRUCTION

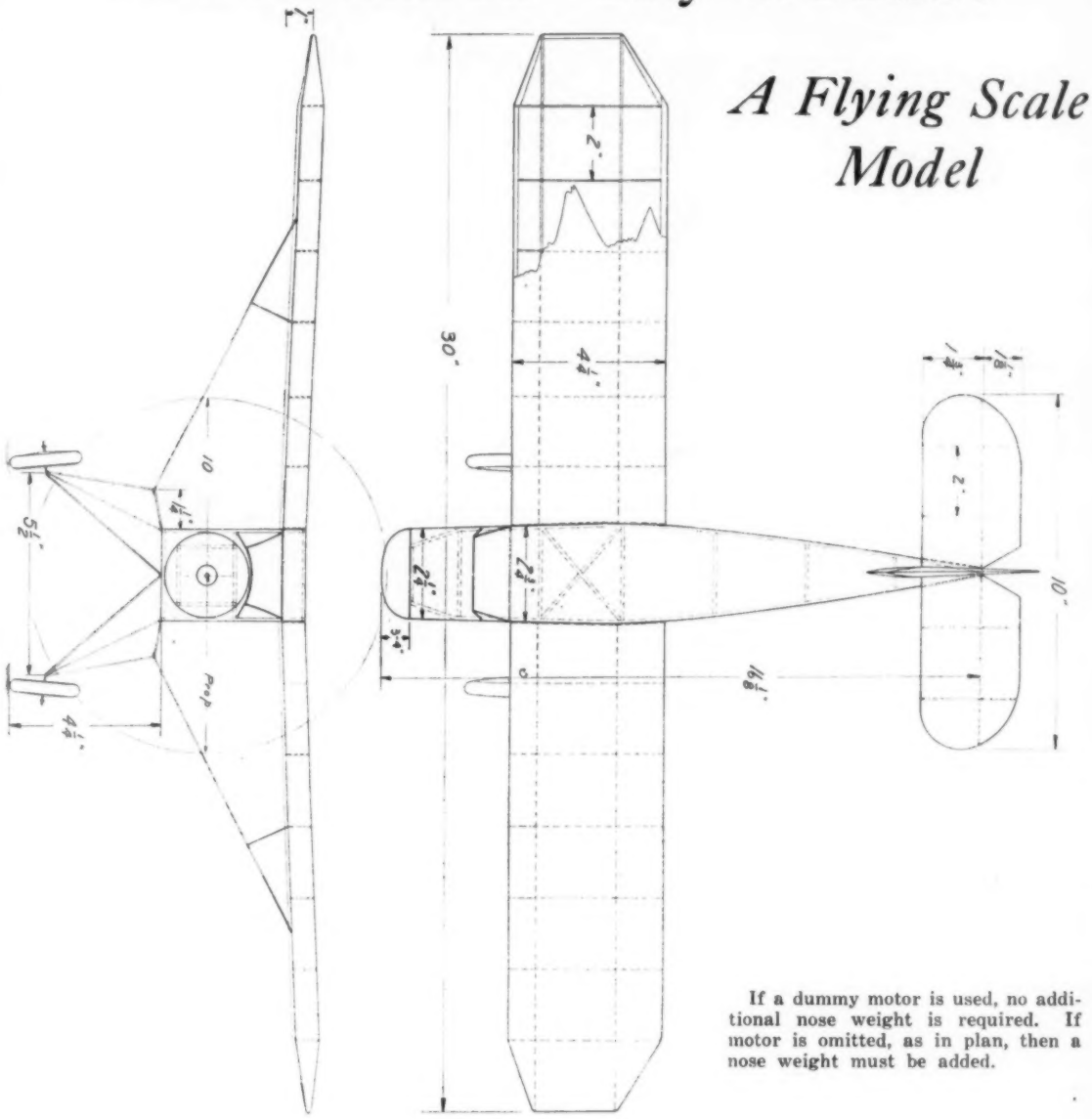
A full size lay-out using the general dimensions as given on the side elevation should be drawn up and such details added or changed as the individual builder desires. The arrangement of the structure as illustrated is simple and works out very well and may be carried out with the assurance of securing good results. Because of the extreme depth the top longeron extends only to the third station.

A small distance below the longeron

(*Continued on page* 322)

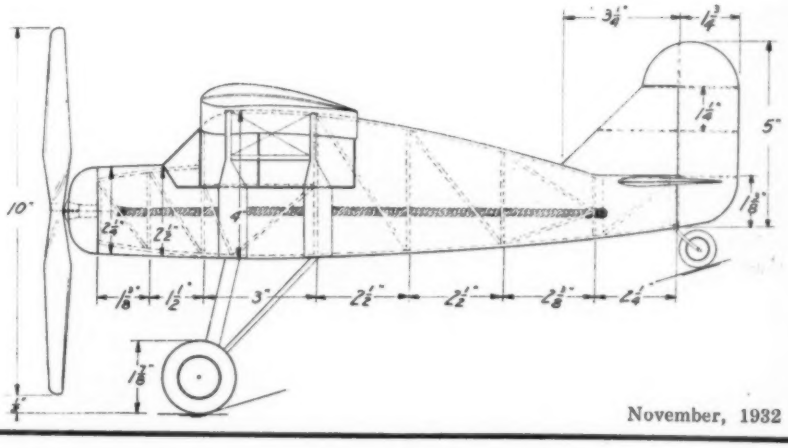
The Bellanca "Sky-Rocket"

A Flying Scale Model



If a dummy motor is used, no additional nose weight is required. If motor is omitted, as in plan, then a nose weight must be added.

If model is very light, the width of propeller can be tapered down toward the ends, this requiring less rubber than with a straight blade.

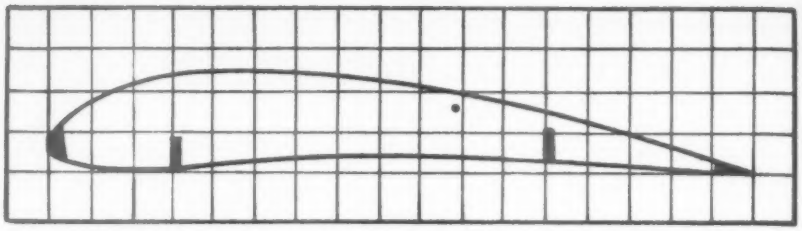


Bellanca Model

(*Continued from page 320*)

at this point, a brace is attached which represents the outline of the window and completes the appearance of the cabin. Three inches behind the third station is an upright that extends to the top longeron. The landing gear is attached one inch behind the third station on the lower longerons.

To prevent the longerons from being forced into the body, two cross-braces that meet at this point are cemented against the lower longeron. At the top front side of the fuselage, at the third station, the curve should correspond with the outline of the rib. The trailing edge of the wing will come below the curve of the top longeron and is cemented against the fourth station.



Full size wing section for 30 inch model. The squares afford a means of reproducing the curve for any other size.

LANDING GEAR

At the position where the leading edge meets the body and the top of the fuselage curves to the same outline as explained above, a solid piece of very light balsa is cemented across the width of the body. To prevent the wing from breaking off at the point where it joins the body, a small thin piece of bamboo should be cemented across the width of the body and extended into the last rib on each wing.

The rubber motor is attached at the rear of the fuselage by a cross-bar which is held in place by small sections of balsa wood cemented as illustrated.

The front view of the photograph should be studied carefully so that the struts will be placed in their proper position when assembling the landing gear. The first strut on the inside as seen from the front view is bamboo, also the second strut. The third strut which is almost in a perpendicular position is thin balsa and meets the first wing strut.

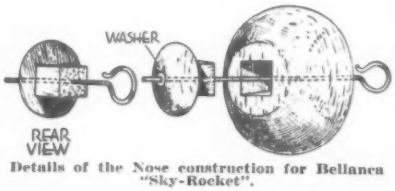
This part of the landing gear strut may be reinforced by cementing a small thin section of bamboo against the leading edge. The small sections of struts which extend out from each side of the body are reinforced by cementing a piece of bamboo to the leading edge and extending it through the body on both sides.

TAIL UNITS

The entire tail section outline is made of bent bamboo. The ribs and the internal structure are made of the remaining parts of the wing. The cross braces used on the elevator and rudder are primarily to prevent warping after the tissue is sprayed with water and becomes taut.

WINGS

The thin balsa used for the wings should be sanded on both sides to slightly decrease its thickness and make a smoother surface. Fourteen ribs in all of the same shape and size are required for the two wing panels. The rib near the body must be offset so that a small angle is allowed to give each wing panel the proper dihedral.



Details of the Nose construction for Bellanca "Sky-Rocket".

Small additional cross-bracing should be used to strengthen this rib so that the covering will not pull the center part of the rib in and leave a gap between it and the body. The wing tip is a continuation of the leading and trailing edges with a one-eighth inch square section rounded off on the outside at the extreme end.

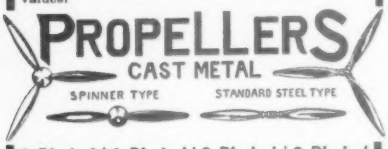
The wing covering may be in two colors: white and green with an opposite color of white or green on the extreme ends, depending on how the color arrangement extends across

(*Continued on page 324*)

NEW LOW PRICES on SELLEY'S Kits, Supplies and Accessories

Never before have supplies of this fine quality sold for so low a price! Why be satisfied with second-rate materials when the finest-made cost no more? Buy in confidence from *SELLEY*, the world's largest model supply house. Just compare these values!

PROPELLERS
CAST METAL



2-Bladed	3-Bladed	2-Bladed	3-Bladed
3¼"..25		3¼"..20	
4"..30	4"..35	4"..25	4"..30
4½"..35	4½"..45	4½"..25	4½"..40
5"..35	5"..50	5"..30	5"..45
5½"..40	5½"..60	6"..35	6"..60
6¼"..40	6¼"..70	6½"..45	
7"..55	7"..80	6¾"..50	7"..70
8"..65	8"..90	8"..60	8"..80
9"..75	9"..1.00	9"..70	9"..90
10"..85	10"..1.10	10"..80	10"..1.00
11"..95	11"..1.25		
12"..1.10	12"..1.50	12"..1.00	12"..1.25

The following sizes are supplied with adjustable blades with special hub, clamping rings and safety screws.

15"..$6.00	15"..$7.00	15"..$5.00	15"..$5.00
18"..7.00	18"..8.00	18"..6.00	18"..7.00
21"..8.00	21"..9.00	21"..6.50	21"..8.00
24"..8.50	24"..10.00	24"..7.00	24"..8.50

Packing and Postage 5c each up to 6" dia., 9c each up to 12" dia., 12c each up to 24"

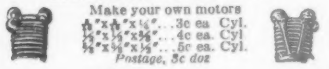
Dummy Machine Guns

Die Cast Metal Pursuit Type Gun...10c

Swivel Type Gun...20c
Packing, Postage 5c each

CELLULOID CYLINDERS

Make your own motors



¼"x¼"x¼"..3c ea. Cyl.
¼"x¼"x⅜"..4c ea. Cyl
¼"x½"x½"..5c ea. Cyl.
Postage, 5c doz

Spun Aluminum Cowls

Diameter	Anti-Drag	Open Cowl	Closed Cowl
1½"	.20	.20	.20
2"	.25	.25	.25
2½"	.26	.30	.30
3"	.30	.35	.35
3½"	.40	.45	.45
4"	.50	.55	.55
4½"	.75	.80	.75
5"	.90	.95	.90
5½"	1.05	1.10	1.05
6"	1.25	1.30	1.25
7"	1.50	1.60	1.50
8"	2.00	3.25	2.00
9"	2.50	2.75	2.50
10"	3.00	3.25	3.00

Packing and Postage 6c each on sizes up to 4" diameter. 10% of price of cowl on larger sizes.

Send 10c for catalog illustrating 1000 items

"You can buy with Confidence from *Selley*"

Selley maintains the largest exclusive Model Store in Greater New York.
Open every day until 9 p.m. Saturdays 6 p.m.

SELLEY MANUFACTURING CO., INC.
1373P Gates Ave., Brooklyn, N.Y.

LOOK! ONLY 60c

Build the SKI-HI **"BULLET,"** a snappy little ship that will give you consistently good flights, and is simple enough for a beginner to build. Complete kit, including—READY-CARVED PROPELLER, stamped ribs, formed wire parts, full-size plans, etc., to build this dandy little 12-inch flyer only.....**60c Post-Paid**

The SKI-HI **"PURSUIT"**—similar to the "BULLET," but a biplane, with a 15-inch wingspan. Complete kit only.....**85c Post Paid**

The SKI-HI World War Trio—**FOKKER D-7, NIEUPORT "SCOUT,"** and **SOPWITH "CAMEL."** All approximately 15-inch wingspan. Your choice of either of the three only.....**$1.25 Post Paid**

Last, but not least, the SKI-HI designed **HAWKER "FURY,"** England's phenomenal 300 M.P.H. fighter. Most complete kit possible, including READY-CARVED PROPELLER, as in all SKI-HI kits, for only.....**$1.50 Post-Paid**

REMIT BY MONEY ORDER ONLY!
SEND 5c COIN FOR NEW ILLUSTRATED LIST

SKI-HI MODEL AIRCRAFTERS—Dept. N-2
Sunrise Gardens, Lynbrook, L. I., N. Y.

Use this handy coupon for
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Send 5c in stamps to cover mailing cost to

Model Plan Dept., Popular Aviation, 608 So. Dearborn St., Chicago, Ill.

THIS FREE OFFER EXPIRES NOVEMBER 10

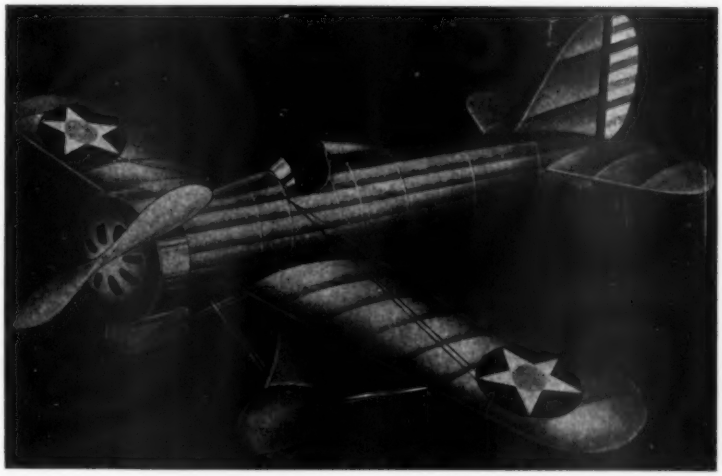
Name.....

Address.....

City..... State.....

NOTE:—Please confine your letters to requests for plans only.

Two More Ideal-Designed 18 in. Flying Models of Popular Ships You'll Want to Build!



HERE are two more beauties in the IDEAL Series of 18 in. Flying Models. The S.6.B. Supermarine and the Curtiss A-8 Attack made a big hit with Model Builders, and now these two new ships are going even better. Builders who want beautiful, accurate, easily-constructed and perfect-flying Models are ordering these Kits by the hundreds. The Models are Ideal-Designed—and that means a lot to any experienced Builder. Every essential detail is designed into the Models and parts furnished in the Kits so you can duplicate them easily and quickly. Most of the hard work is done for you in Ideal Kits, and you can get your Models into the air in half the time required than when you build with less complete Kits. And Boy! How these Models will fly!!

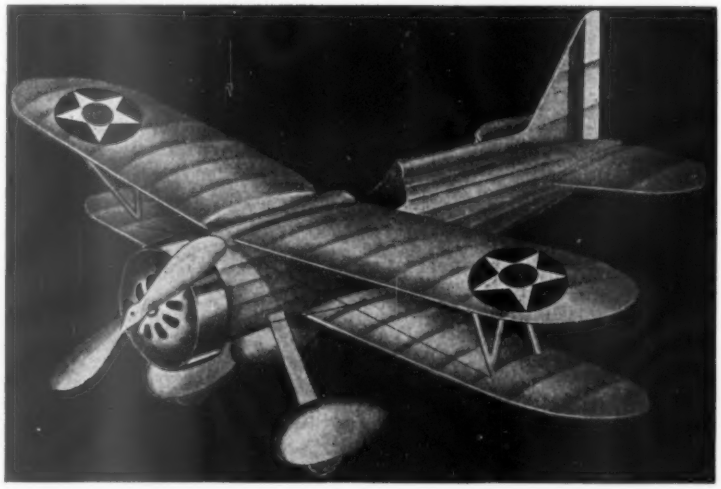
Look 'em over. These are actual photographs of the finished Models and we put them on a black background to attract your attention and make every detail stand out clearly. All the little details are there in Ideal-Designed Models, and you can see them.

Ideal-Designed BOEING XP936

The U. S. Army's pursuit plane, recently released and still in the experimental stage. This Ideal-Designed Model is a faithful reproduction of the original in every essential detail.

IDEAL Quality Complete Kits $1. EACH

(Postage Extra—See Below)



Ideal-Designed AKRON F9C-2

The U. S. Navy's Midget Curtiss that takes off and lands aboard the Dirigible Akron. This Ideal-Designed Model is a wonderful reproduction of this remarkable ship. All the little details are copied carefully and designed into the Model so you can include them easily.

Still Going Strong!

6 in. Miniature Replica Models for exhibition purposes are making a big hit with those who admire beautiful Models. They're absolutely perfect copies of the real ship; in construction detail and coloring. The Kits are so complete you can make one in an hour!

Your Choice of 20 Different Models

Curtiss Fledgeling	Gee Bee	Hawk P6-E	Albatross
Pitcairn Autogiro	Nieuport	DeHavilland	Fokker Triplane
Ideal Spad	Supermarine	Vought Corsair	Curtiss S. B. Fighter
Laird	Hell Diver	Boeing Fighter	Pfalz
British S.E.5	Lockheed Vega	Howard Racer	Sopwith Camel

ANY 2 KITS for 65c — 6 for $1.65; 20 for $5.00; 12 for $3.00 All Postpaid

DEALERS: IDEAL Airplanes will make money for you. Write for Dealer Discounts and Special Introductory Proposition

You'll want to build these two new ones, and if you haven't tackled the A-8 and the Supermarine there is still time because orders for them are coming in every mail. The Kits are all the same price—$1.00 each, plus postage.

IDEAL Kits are complete—they always have been the most complete and IDEAL has always done more of the difficult work for you. Design patterns are printed on balsa ready to cut out; all wire and metal parts are finished ready to use; new carved balsa props are furnished. Liberal quantities of cement, dope, rubber, silk tissue, reed, bamboo and other such materials are in every Kit. Many of the things you have to make yourself are made for you in IDEAL Kits!

IDEAL plans never have you guessing how to do it right. They are clearly printed with diagrams and instructions in FULL-SIZE; you can lay the parts right on the plan and check them for accuracy. There's no guess work with IDEAL Kits. Only IDEAL'S long experience (more than 20 years) could produce Kits like these at this low price.

You'll want to build one or more of these dandy Models—and right now is the best time so you'll be the first to have one. In fact, if you want to double your fun and save a little money order two or more Kits at one time.

Kits Sent Postpaid if You Order Two or More at One Time!

If you order only (1) Kit, send $1.10 (a dollar bill and 10 cents in stamps in a registered letter). The extra 10 cents is for postage. If you order two or more Kits at one time, send only $1.00 for each Kit. We will deliver postpaid. But send along your order so you'll have your Model in the air quickly.

IDEAL AEROPLANE & SUPPLY COMPANY, Inc.

22-26 West 19th Street
NEW YORK, N. Y.

Send Canadian Mail Orders to
CANADIAN MODEL AIRCRAFT
47 Hawarden Avenue, Montreal
(Canadian Prices are 40 per cent higher to cover Customs duty)

NATIONAL MODEL KITS

are known everywhere for their ACCURACY and HIGH QUALITY

—because of the painstaking exactness with which they are designed. National models are faithful replicas of original ships and are guaranteed to give maximum flying performance when built according to the instructions.

National blueprints and instructions are complete in every particular. Each kit contains all necessary material to the last detail. National features: correct colored tissue, and insignia, all printed and cut wood parts, formed wire parts, rubber, cement, pants and wheels according to type of plane.

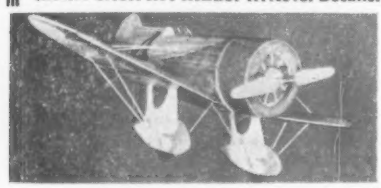
Whether you are a thoroughly experienced model builder or a beginner now is the time to buy one or more of these National kits and learn what a genuine thrill it is to build and fly National models.

18 in. Boeing P-12-E and F-4B-3
A combination kit of the new 18 in. Army P-12-E and its sister Navy ship F-4B-3. Complete blueprint and instructions. All materials to build two finished flying models. Colors: Khaki and green, yellow and white, with correct colored insignia. **2.50**

18 in. Curtiss A-3 Attack
The new army ship, that you have read so much about. Build a perfect model with the 18 in. National Junior kit. It is different than any other weapon of the air you have yet built. Colors: Green and yellow with correct colored insignia. **1.50**

12 in. Akron Fighter
The little Navy ship attached to the Akron. It models perfectly in a 12 in. midget as here pictured. You will be sure to want one of these new defense models. Colors Navy blue and yellow with colored insignia. **1.00**

Enroll Now in NATIONAL'S FLEET MODEL CONTEST
$160.00 CASH IN PRIZES. Write for Details.



24 in. Gee Bee Sportster
The famous racer, flown by Lowell Bayles, 1931 Thompson Trophy winner, and with its several design changes, and new motor, this marvelous ship flown by Maj. Doolittle again wins the 1932 Thompson trophy. National's new 24-in. Gee Bee Kit will offer you the opportunity to build an excellent model with all the latest features of this outstanding speed plane. **2.00**

Fokker D-VIII
A German war-time model. The 12 in. National midget is a very easy model to build and an excellent flyer. Colors: Red with black markings. **1.00**

Hell Diver
A famous modern navy plane. The 12 in. midget is an exact miniature, in all detail and a good flyer. Colors: White and navy blue, with correct insignia. **1.00**

S. P. A. D.
A war time model, flown by Capt. Rickenbacker. The 12 in. midget model is an accurate scale miniature of this famous plane. Complete in colors and insignia. **1.00**

FREE! National monthly bulletin supplements the general catalogue. Chock full of news to model builders. Illustrates and describes new models, and quality supplies. Contains special monthly offerings. Write for your free copy to-day.

New Catalogue "F"—48 pages, illustrating 50 Different Models 10c

HOW TO ORDER

Write or print plainly full name and address. For packing and postage add 15c to cost of merchandise on all orders up to $1.50, over $1.50 add 10%. Remit by P. O. or express money order or check. We insure all shipments without cost to you.

NATIONAL Model Aircraft & Supply Co.
Blue Bird Bldg. Dept. X-1 New Rochelle, N. Y.

Bellanca

(*Continued from page 322*)

the top surface. The under side of the wing is entirely white.

WING STRUTS

The wing struts are cut from thin sheets of balsa and should be attached only after the covered wing and body have been assembled. This will allow for measurements of the correct length and the proper setting of an equal dihedral angle on each side of the wing. The entire landing gear and wing struts should be given one coat of dope and then lacquered black.

NOSE

The nose is built up in two sections with a small plug having a square end that sets into the large round nose piece. A small washer is cemented to the front of the plug, which acts as a bearing. See detail of small drawing showing this arrangement clearly.

PROPELLER

The propeller is built in the conventional way, and if the model is very light, two ounces or less, the width of the blade may be trimmed down to a very narrow section. A large pitch may be used and where the area has been cut down less rubber will be needed and a longer flight can be secured. To strengthen the propeller, apply two or three coats of dope, sanding after each application.

Alignment

When assembling, the greatest care must be taken in obtaining true alignment of the various parts, particularly the wing and the tail group.

The wings must be exactly at right angles to the fuselage and set at the correct angle of incidence.

END

LAIRD SUPER SOLUTION

Flying Scale Model Delux

18" Wingspread. Weight 2 oz.

This New Hollow Balsa Fuselage Model is an exact copy of the 250 M.P.H. Laird Supersolution. Const. Set contains finished hollow balsa fuselage with rubber installed, 6 Cyl. 3 in. celluloid motor, threaded prop shaft, special spun aluminum cowl, carved silverized balsa prop. Silverized celluloid wheel pants, striped, streamlined wing and gear struts, silk for wings, ready-cut ribs, laquer, full size drawing. This is one of the strongest and most perfect models of its kind ever made. Nearest thing to the real plane.

Const. Set ..... **$ 8.50**
Model Ready to Fly **15.00**

We sell air and gas model motors. Also Model Sets from $1.00 up, from 18" to 96" span.

New Catalogue 5c

MINIATURE AIRCRAFT CORP.
83 Low Terrace, New Brighton, N. Y.

Airy Chat

(*Continued from page 278*)

performance of a ship, if the proper wing section is used in the first place. Well, it's too bad that they think so, for the recent trials in Europe certainly demonstrated that some startling take-offs were possible with the slotted-wing—better than we have seen any simple wing do. And then, do you remember the snappy performance of the "Doodle-Bug", another slotted-wing creation, at the Chicago Meet in 1930, and again the selection of the slotted-wing "Tanager."

* * *

WELL, folks, the big show is now on with a bang. We received entry No. 1 for the First Annual International Airplane Model contest, just as we are going to press. This is a mighty quick come-back, for our October issue was only on the news stands for a few days before this letter came in. The name of entry No. 1 is Whitnew Snow and he comes from Hollis, N. Y. See if you can't distinguish yourself by being among the Early Birds of modeldom.

* * *

NOW, we have a highly interesting letter from Carl Ogilvie, who writes an entertaining account of his activities is his home town. Mr. Ogilvie is the author of the fine war stories that have appeared from time to time in POPULAR AVIATION. And here we go:

For recreation and exercise I indulge in the great American pastime of managing two baseball teams of a nearby volunteer fire department to which I belong. (Due to God's gift of a flaming top-knot, I am also officially designated as the Chemical Truck's "Taillight").

During a recent game with a rival fire company's team, their pitcher suddenly paused while on the mound, pointed a finger at me and hollered: "Hey, Red! I got you spotted now."

I thought he meant that he was going to fan my players, one, two, three.

After the game (don't ask the score) he ran over to me, and with his eyes sparkling with excitement, he said: "Say, all through the game I was trying to figure out where I'd heard your name before. It's an unusual one around here. Now I know. Aren't you the guy that wrote that German Aces article in POPULAR AVIATION*?"*

With shy, downcast eyes, I admitted the truth.

He said: "Say, that was swell. I read that magazine every month."

(*Continued on page 326*)

GUARANTEED FLYERS!
Start Building Your Models NOW in Time for the Popular Aviation Contest

10 in. Baby R. O. G. Kit... **30c**pp.
12 in. U.S. Army Hawk Kit..... **45c**pp.
24 in. Kit of S. P. A. D.... **65c**pp.
24 in. Kit of AUTOGIRO **65c**pp.
24 in. MARINE FALCON Kit.....65c postpaid

Remit by Check, Stamps or Money Order
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GHQ MODEL AIRPLANE & SUPPLY COMPANY
710 East 149th St. (Dept. P) New York City

Mothers! Dads! and all Gift-Givers!

Cleveland-Designed models are favorites everywhere among model builders. The authenticity of their designs, wealth of details, and advanced features—years ahead—have won enviable leadership. All these important assets of course cost more to embody, but they're what all real model builders want. Therefore, we urge you to give Cleveland-Designed Model Kits, and make the recipient happier because when it's finished, he'll have a real authentic model. Everything guaranteed to be as represented, or your money refunded. If returned for any other reason, a 50c charge is made; west of the Mississippi, 75c.

EDWARD T. PACHABA, *President.*

These Long Fall Evenings Pack a Brand New Thrill

if you're building one of these "C-D" Authentic Scale Flying Models

Here, in response to thousands of requests, are the two newest Cleveland-Designed flying models—Curtiss A-8 Attack Plane and Lockheed Vega. Each is even prettier than the photographs suggest. Don't delay getting these Kits—if your dealer can't supply you, order direct.

Even 4 pictures can't do real justice to this—

CURTISS A-8 ATTACK PLANE

It's the realest model you've ever seen. Has everything—even instrument boards! All the flying zip, extreme maneuverability and death-dealing accoutrements of America's new "terror of the sky" are packed in this master model job in true Cleveland-designed thoroughness—detailed to the last feature—machine guns, windows, gas tank, depth wing flap; dummy motor incidentals, venturi, and pitot tubes, etc., etc. All balsa wood supplied is **printed out** and numbered—just crammed full, and we don't mean merely a few so-called "stamped" pieces, either, but all irregularly shaped parts as well—on 15½ pieces of 2"x18" stock of the various thicknesses necessary in design. This simplifies and authenticates construction—merely cut out numbered parts and assemble 'em. This Kit, as all Cleveland-Designed Kits, contains everything needed (excepting touch-up black, for which purpose ink or black dope may be used). Also includes the new Cleveland enamel dopes, which give it that new finish everyone is talking about. Authentic ¾" scale. Span is 33"; length 24"; weight 4.7 oz.; colored Army yellow and olive drab. Complete **Kit SF-25**, postfree $2.95. (Special Delivery mail, for U.S. customers only, 25c extra).

The last word in a model

LOCKHEED VEGA

Here is a real model of this famous ship—as you thousands of men and boys have requested. And we mean REAL! First time this authentic Cleveland-Designed model was put on display, our engineers were told it was one of the most beautiful scale models ever designed—and that was from not only model builders, but model sellers as well. This model follows no particular Vega, but the color scheme is that of Amelia Earhart's red and gold monoplane in which she recently spanned the Atlantic. For

flights this Cee-Dee model is a wonder. Don't delay getting it. Span is 30¾"; length 21"; weight 3.7 oz.; colored brilliant red wings; tail surfaces and wheel shoes; everything else gold except black details, for which ink may be used. Kit is complete in every respect, even with the new enamel dopes and printed and numbered balsa same as A-8 Attack Kit. Complete **Kit SF-24**, postfree $2.95. (Special Delivery mail, for U.S. customers only, 25c extra).

Send for Your Copy

of the CME Technical Bulletin for Cleveland Model Engineers. Packed with news, details and pictures of the 45 Cleveland-Designed Flying models. Enclose 5c to defray mailing expense. Use the coupon below.

Here's the "CEE-DEE" Line of Flying Model Kits

Authentic ¾ in. Scale Flying

SF- 1: Sport-Trainer	$2.50	SF-14: Fokker Triplane	$2.50
SF- 2: Mystery Ship	2.95	SF-15: Fokker D-7	2.50
SF- 3: D H 4	3.50	SF-16: Albatross D-3	2.50
SF- 4: Curtiss Jenny	2.95	SF-17: Cee-Bee	1.50
SF- 5: Laird Solution	2.50	SF-18: Howard Racer	1.00
SF- 6: Polish P.6	2.95	SF-19: Supermarine S6-B	2.50
SF- 7: C. Helldiver	3.50	SF-20: Hawker Fury	2.50
SF- 8: Boeing P.12.C	2.95	SF-21: Hawk P.6E	2.50
SF- 9: SE-5	2.50	SF-22: Akron F9C-2	1.95
SF-10: Sopwith Camel	2.50	SF-23: Boeing XP936	1.95
SF-11: The Quad	2.50	SF-24: Lockheed Vega	2.95
SF-12: Nieuport Scout	2.50	SF-25: Cur. A-8 Attack	2.95
SF-13: Spad 13	2.50		

Authentic ⅝ in. Scale

JSF-1005: High Performance Boeing Bomber $2.50

⅜ in. Scale Semi-Profile

FL-301: Amphibion	$2.50	FL-303: Pirate Bomber	$2.50
FL-302: Trimotor	2.50	FL-304: Commodore	2.50

Large Outdoor Profile Fuselage Models

FL-201: C. Robin	$1.95	FL-203: C. Bull-Pup	$1.95
FL-202: C. Sirius	1.95		

¾ in. Scale Profile Fuselage Models—All 85c

FL-101: Two Gliders	FL-107: Mystery Ship
FL-102: G L Trainer	FL-108: Boeing Mail
FL-103: Fleetster Mono	FL-109: Curtiss Robin
FL-104: Boeing P-12	FL-110: Vought Corsair
FL-105: Eaglerock Bullet	FL-111: Lockheed Sirius
FL-106: Curtiss Hawk	FL-112: Curtiss Falcon

NOTE: Cleveland's new completely printed out balsa is contained only in Kits Nos. SF-22, 23, 24 and 25.

GEE-BEE $1.50

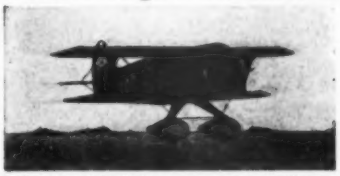
¾" scale. Span 17½"; length 12"; weight 1.5 oz. Yellow and black. Complete **Kit SF-17**, postfree

HOWARD RACER $1

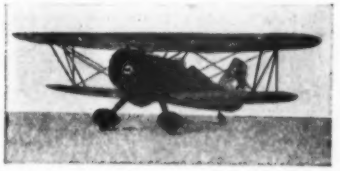
¾" scale. Span 15"; length 13⅛"; weight 1.3 oz. Colored glistening white. Complete **Kit SF-18**, postfree

All pictures on this page, as in all our advertising, are of the actual Cleveland-Designed models themselves—*we never use photographs of the big ships!*

Laird Super-Solution



Matty "Jimmy" Doolittle's own racer—the 1931 trans-continental record breaker. Flies beautifully, many hundred feet. High powered speed. ¾" scale. Span 15½"; length 13⅛"; weight 1.7 oz. Colored yellow and green. Complete **Kit** (everything needed) **SF-5** only $2.50 postfree. (Special Delivery, 15c extra).



Curtiss Hawk P. 6 E

Plenty of features including all the newest design advances Cleveland has developed. ¾ in. scale. Span 23⅝ in.. length 16¾ in.; weight 2.9 oz. Flies, zooms, does everything. Colored yellow wings and tail surfaces, everything else green, except black details. Complete **Kit SF-21** (everything needed), postfree for only $2.50.

Ask Your Dealer First

for the Cleveland-Designed Flying Model Kits you want. If he hasn't or can't get what you're after, don't accept substitutes, but order direct, and please mention dealer's name. Immediate service given on all orders as everything is kept in stock.

CLEVELAND MODEL & SUPPLY COMPANY

1866-PA11 West 57th Street
Cleveland, Ohio, U. S. A.

Foreign Customers

On all orders, send 15% extra, except to countries where transit charge applies, then send 30% extra. Ask your Postmaster. Customs payable by purchaser only, upon arrival.

CLEVELAND MODEL & SUPPLY CO., 1866-PA11 West 57th St., Cleveland, Ohio.

My store dealer's name is.....

Please rush the following order, for which I am enclosing $.....

I would like to see the following ships Cleveland-Designed:.....

.....

Name.....Address.....

City.....State.....Age....yrs.; Model Experience.....yrs.

☐ CME Bulletin, 5c

☐ Kit No..... @.....ea.

☐ ..... @.....ea.

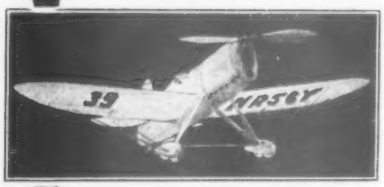
☐ ..... @.....ea.

☐ ..... @.....ea.

☐ ..... @.....ea.

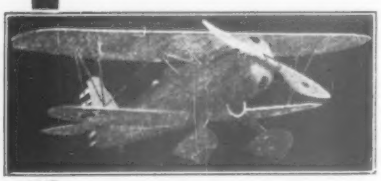
Total.....$.....

Four "High Spots" in Pioneer's *Complete* Airplane Model Line . . .

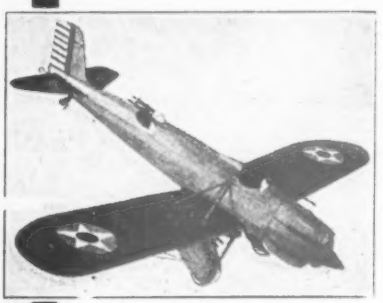


NX39 New Howard Racer
Wing span 20½ in.—wt. 7 oz., duration 95 seconds. Unique double wheel landing gear, high thrust line, beautiful streamlining. All balsa to dimension, p op blanked out, full size layout and instructions, everything needed to make this Aerol Trophy winner! Postpaid..... **$1.50**

THE AKRON FIGHTER
Looks like the real thing doesn't it? Parts cut, prop carved, celluloid ring, motor and 3 wheels, all balsa to dimension, full size layouts and instructions; such a wonderful kit you have never seen before. Model 23½ in. span, wt. 1.8 oz., duration 50 sec. Kit complete..... **$2.50**



CURTISS HAWK P-6-E!
A big 15-in. (not 12-in.) model, prop blanked out, all balsa to dimension, full size plans, etc. A model that stunts, rolls, loops and performs all the "aerobatics" of the real ship. What a model! Kit complete postpaid..... **$1.10**



CURTISS ATTACK A8
A 26-in. span 1¾-oz. model that flies with surprising climb and speed, releasing a bomb at the top of its flight. Six machine guns, 3 celluloid wheels, nose and "p op," blanked out, star insignia, etc., are features of this marvelous performer. Duration 90 seconds. Kit complete..... **$1.95**

Four of our Newest Designs — Quality Kits at Moderate Prices

Models of B. O. Howard's new 200 H. P. racer "Ike;" the doughty little Akron Fighter, that stows away in the hold of the Navy Dirigible; the Curtiss Hawk, favorite of all red-blooded American youth; the Curtiss Attack A-8—the most diabolical fighting craft ever designed.

Why Pioneer Models Are *Right!*

All Pioneer models must answer these requirements before they are offered to *you*, Mr. Model Builder—

1st. Does the design of the real machine lend itself to *the making of a better-than-average flying model?*
2nd. Is the actual machine a worthwhile advance in big ship design—and not just a "re-hash" of "old stuff."
3rd. Can it be designed into a model of sufficient size to fly well without costing too much? Usually, Small models do not fly well.
4th. Is it approved by the Pioneer club of 183 members?

Then and then only, is it offered to *you!*

Send 10c in Coin For the New

Combined "Model Flyer's Guide" and Pioneer Catalog

The biggest value ever offered—a revised edition of "The Guide" which has never sold for less than 35c and a new catalog which contains the "sweetest" line of models and supplies at money-saving prices we have ever offered. All in one big book. Be sure to get your copy! It will be your most valuable helper in modeling.

No Stamps Please
A Dime Brings It!

Order kits direct from this ad—add 5c for postal insurance.

PIONEER MODEL AIRPLANE SUPPLY CO.
Champaign, Illinois

Airy Chat
(*Continued from page 324*)

I asked him if he had seen my article in the June issue. He said that he couldn't remember and my vanity was wounded. Later, that evening he phoned me that he had looked up the June issue and read the article and that it was good, too. I was relieved to learn that I hadn't received money under false pretences for it. Then he said any time that I needed a good pitcher that he'd be glad to do the honors for me.

Ah, me! Such is glory and fame. If this keeps up, I'll have to organize a POPULAR AVIATION *readers' ball team in this county.*

Well, ain't this something. You meet P. A. readers everywhere, even in the heat of a volunteer fire department ball game!

* * *

HERE's an announcement that should start something with you fellows who are building ships, gliders, models and other aeronautic apparatus. This announces the addition of a BARTER AND EXCHANGE department in this magazine for the benefit of those readers who have something that they do not need and wish to exchange it for something that the other fellow does not need, avoiding the actual exchange of money.

Thus, Fred Smith can swap his converted motorcycle engine for a completed fuselage, or what have you. This service, of course, is free to readers of POPULAR AVIATION. All that you have to do is to write in, tell us what you have to swap and what you wish to swap it for. Attach your name and address, and that's all there is to it, except to remember that POPULAR AVIATION is not responsible for any of the deals that are pulled off. Just remember, you are trading "sight unseen" unless you make other arrangements with the other party to the exchange.

* * *

EVERYBODY seems to have the parachute fever lately, which is not a bad idea at that. And with this increasing popularity and experimentation with the chutes, is a rapidly improving control and technique. In the first place, and this is probably one of the principal reasons for the parachute mania, you do not require a license for jumping. In the second place, the parachute affords the quickest and cheapest entrance into the kingdom of aviation.

* * *

AVIATION is a wonderful thing for the oil companies—it has the automobile beaten at its own game in respect to gasoline consumption. According to a government report, the airlines of the United States burned 11,000,000 gallons in the first half of 1932, which is at the rate of 22,000,000 gallons per year. Just get out the old pencil and figure out how many flivvers and tin lizzies this would support. And besides this amount is the tremendous gallonage consumed by the Army and

Navy flyers, and the gas consumed by private planes.

* * *

AND is the lightplane getting economical with gas! Harold Alford, a Chicago boy, beat the world's lightplane endurance record, by staying aloft 11 hours 7 minutes with only 30 gallons of gas and one quart of oil.

* * *

GUY DATO, Chicago, Ill., writes in his idea of an amateur association that he believes will work for the good of all persons interested in flying. It's not a bad idea at all, and possibly something can be done about it. Here he is:

I wonder why the American amateur flyers do not get together and form a national association for the promotion of their interests. This has been done by the radio amateurs with wonderful results, and as a body, the radio amateurs have made rapid progress.

Now, I don't mean that the activities of such an association need be confined to battling adverse laws. Its main function would be to pool our knowledge of flying and airplane construction so that all of us could benefit by the experience of the other members. In short, the association could be made a clearing house for ideas, and ideas are what we need.

Just as an example, we have the Amateur Radio Relay League, which has done much to advance the science of radio. The members all work together for the common good, and as a result, radio is progressing instead of lying dormant.

This is what has been needed for a long time, but no one seems to have taken enough interest in the project to promote it. POPULAR AVIATION stands ready to do anything in its power to promote a national association providing that it is supported by the amateurs in the game. Speak up! Who's first?

* * *

OH, GIRLS! How many of you are interested in having a real women's department dealing with the latest activities of women flyers? This move is being seriously considered by POPULAR AVIATION, but before we start, we would like to know how many women are regular readers of this magazine. So just get your pen and paper, and report via the U. S. Mail system. If you wish it, you will get it, but we will be compelled to put you to the trouble of writing your opinion.

* * *

AND, home-builders, attention! In the next issue will be a hot article on the conversion of a Ford engine into a lightplane power plant. This is by B. H. Pietenpol, an expert in this line who will deal out the real dope. Now's the time to start on that engine conversion for next spring's flying.

* * *

AND so the monthly broadcast from station P. A. comes to an end. I'll be seeing you in December.

J. B. R.

Building Army Planes

(*Continued from page 292*)

But the story does not end there. Nearly everyone at Wright Feld is suspicious and never satisfied. Although the new ship may be the last word in fighting craft, the aviation specialists suspect that it contains some weaknesses that were overlooked and are not content with its present speed nor other performance characteristics.

So, day after day, a program, amazing in its ramifications, proceeds. Engines, both American and foreign, are forever being studied, worn out, torn to pieces, and re-designed. Propellers are designed, studied and tested in an effort to reduce noise or to obtain some other advantage; new metal alloys are evolved; aerial photography is being made a more useful military activity, recent advances including perfection of a five-lens air camera of great map-making ability; fuels are studied, in an effort to keep American plane performance on the top of the world or to raise it even higher; and so on and on.

Often, in conducting tests on parts of planes already in service, engineers will discover a weakness that had been overlooked in the past. Or it may be that an accident to a plane in service has revealed an unsound part. In either event, if the condition is serious enough, all army units where other planes of the same type are stationed are notified by telegraph or radio, and faulty ships are grounded. Or if less serious, temporary repairs may be made, or the fault left as it is for further observation before a radical change is made.

THE engineering cost of experimental plane models may reach $75,000 for a single-seater pursuit ship, or $100,000 for a two-seater job. Light bombers come at $150,000, and heavy ones at $200,000. But it is the engines that are in the high-price class. To bring out an experimental engine of any type requires about $250,000, with an additional quarter of a million for engineering costs of refinement over a two-year period of production.

A lot of money, no doubt; but if similar development work had been done on airplanes and engines prior to the World War, numerous millions of dollars would have been saved taxpayers through the elimination of a lot of lost motion and careless spending, to say nothing of the military advantages that would have resulted.

There has been some talk about the designing of a racing plane which would surpass the present world's record of 408 miles per hour. This task, although it may sound simple, would involve, among other things, the following, according to Major C. W. Howard, Chief of Engineering:

Research and experimenting in an effort to improve fuels; an exhaustive study of super charging; perfection of the method of fuel injection, which

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Ribs, Bulkheads, fairings and other parts clearly printed on balsa wood; 3 finished, turned, balsa cowlings, ready to be attached to plane. Finished turned balsa wheels complete with bushings; Ready-shaped propeller; semi-finished hollowed out pants. Letters for top and bottom wing and rudder, ready cut out and gummed. All wire fittings ready formed; 1 oz. banana oil and colorless cement, and special colored dopes; 2 large sheets of fine tissue; bamboo, rubber motor, and all other balsa strips cut to size. Wing Span 26¼". Length 17½". Weight, 1 oz. Colors: Dark Green and White. Complete. . . 1.50 Post Paid

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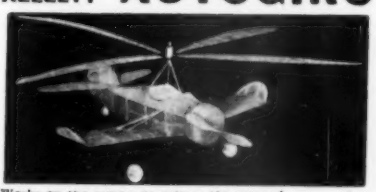

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eliminates carburetors and their troubles; efforts to develop better propellers; building of engines cooled by evaporation; development of wing structures containing cooling condensers to operate in conjunction with such engines; a study of engine structure, with efforts at developing better designs.

A plane flying at more than 408 miles per hour, with a probable maximum at 500, would require a power-plant developing between 3,000 and 3,500 horsepower and capable of running two hours. Theories and past practice indicate that the ship would be a land-plane of monocoque construction, a low-wing monoplane, all-metal, with wire-braced wings. The liquid-cooled engine would be built into the fuselage with maximum streamline design. No engine in use today can develop up to 3,550 horsepower.

The cost of developing such a plane has been estimated at approximately $5,000,000, and the time required would be three years. Then, after such a plane were perfected for racing, its value to military aviation would be doubtful. Also, many of the engineers believe that it would be more sensible to spend $2,000,000 for perfecting a smaller liquid-cooled engine involving new principles and then design a pursuit plane about it rather than to try to smash the world's speed record.

The Materiel Division of the Air Corps has many new types of experimental planes undergoing tests. This is in considerable contrast with the old DH, Curtiss Jenny, Martin Bomber and the Liberty engine that, a few years ago, were the main items of Air Corps equipment.

One of the outstanding results achieved, by analyzing airplanes and smashing them to pieces in order to discover concealed points of weakness, has been the growth of popularity of the monoplane. It seems that, in aviation as in other things, there is a cycle of development. It was a biplane that first demonstrated practical flight. Then the monoplane came into extensive use as a fighting craft during the war. Then the biplane had its day and now the monoplane is staging a comeback. But it is a more perfect, efficient monoplane.

FROM a military standpoint, the monoplane is desirable because it gives the pilot a better view, provides a greater area of gunfire and is clean from an aerodynamic standpoint. On the other hand, the biplane still is more maneuverable and compact and has less structural weight. But its struts drag, its vision is poor, and gunfire areas are less than in a monoplane.

Just now, pursuit, training and observation planes may take either form, but the best bombers are monoplanes. Just as soon as some problems concerning internally-braced wings and similar features are worked out, so that the monoplane equals or surpasses the biplane in all respects, the monoplane will become the only survivor in the field of military flying machines. This is the opinion of Major Howard; and it is the end towards which the designers, "X-ray" men and scientists at Wright Field are working.

Aside from the developing and the cooperating with manufacturers in the developing of planes as a whole, Wright Field engineers are forever studying other problems and adding new strength to the structure of national defense.

For instance, the three-bladed propeller has, like the Princess Engenie hat, staged a come-back. But, unlike the hat, it probably is here to stay for a long time. Its re-introduction made necessary a change in the firing of machine guns through propellers. The synchronizing mechanism had to be readjusted so that every shot is fired through the same space in the propeller. The Material Division makes a practice of perfecting many propeller designs and then ordering a number of units of each design from manufacturers. In this way a large reserve of dies is being built up so that, in the event of war.

END

Howlers

(*Continued from page 304*)

found out that the average person thought that getting a license for an airplane was about as simple as getting one for an automobile and perhaps involved a payment of a few dollars and the signing of some papers before a notary. We later found that the majority of legislators didn't know much different.

We next determined that about two-thirds of the plane owners in North Dakota at that time were unlicensed and would have to quit and sell out. As far as selling out was concerned, well their ships under the law would have made good bonfires. We also found that unlicensed ships were doing the most flying, and, what was still more astounding, the licensed planes and pilots held the record for accidents.

To make a long story short we (a small group of pilots) went down to the capital during the legislative session and knocked that law for a row of tail-skids. Some of the legislators themselves admitted that they voted the law in without really looking into it. Anyway we found out we were as good talkers as some of the big guns who talked them into passing the law in the first place.

The law in North Dakota now reads that no unlicensed ship may be flown for hire. That is all right, for it enables anyone to tinker around all he pleases and I think the tinkerer and private plane owner do as much to sell aviation as any big company on the inside ever did.

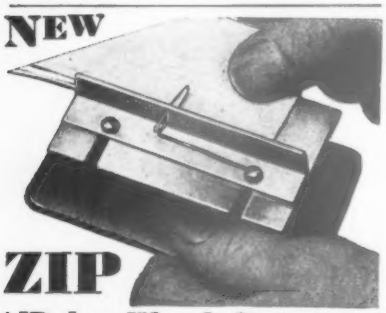
Since the law was passed three of us here have received our personal and airplane licenses. If we want to fly for hire, of course, we should be licensed, but in the other case it's our own business. Though we are licensed, we are still as ardent allies of the private plane owner and builder as ever.

I could write more telling of my experiences in rebuilding my OX-5 biplane for license last winter, but my letter is too long now.

I enjoy every bit of POPULAR AVIATION, *but one question has always bothered me—when are you going to increase the size of your Buyer's Directory so we can contact more fellows who want to buy, sell or exchange used airplanes and supplies?*

This is a mighty fine letter that should put enough courage into all of us so that we will also go and face our legislatures in the sanctity of their own dugouts. This is the first time that P. A. has heard of a direct personal appeal or challenge being made to the lawmakers and we therefore congratulate Mr. Agar and his aggressive pilot friends who stood up for their rights in this matter. Further, we should like to hear from him about fixing up the ship for meeting the law. Thank you.

END



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Blimp

(*Continued from page* 288)

of Texas. The thing looked simple. So much for the route.

A non-rigid airship is different from any other form of transportation. The automobile is completely self-contained; it can travel wherever there are roads and filling stations. It can park out wherever it stops at night. The airplane can set down wherever there is a level stretch of ground and while the shelter of a hangar is desirable, the pilot can stake his ship down and park out in the open if necessary. The steamship requires a more complex organization.

LIKE the plane, but unlike the automobile and the surface ship, the blimp is amphibian. It need not stop when it reaches the land's edge nor the sea coast. It is indifferent to what the earth's surface is like beneath. Like the steamship, it requires ground terminals, in our case, hangars or docks.

Between Los Angeles and Akron there are just three hangars big enough to house the Volunteer, those of the Army Air Corps at El Paso, at San Antonio, and at Scott Field near St. Louis—comforting to think of as emergency shelter but too far apart to be used as stepping stones in our trip.

Now the harbor for a blimp, when out on the road, is a portable 18-foot mooring mast erected on top of a bus. Outriggers carrying small pneumatic tires at the extremities prevent the blimp from turning the bus over on its side in case of a quick windshift. During 15 days' trip en route, including stopovers (we spent two days at Phoenix and two days each at the Army stations at El Paso and San Antonio), we were to camp out eleven nights on the mast.

We got away to an early start toward the mountains. The ground crew's bus set off, climbing winding roads. We sat back at ease, watching the sun rise. San Gorgonia, the main pass over the coast ranges, proved easy. The fates were kind and the air was calm. We slid through almost in still air, and came out at the desert's edge at Palm Springs. Futher on, we dipped down and skimmed the surface of the Salton Sea, flying at 100 feet below sea level. We reached Phoenix that night with 500 miles behind us.

There are mountains enough through Southern Arizona and New Mexico, as the map shows. But from the air we saw a simpler topography, unending stretches of desert with scattered mountain ranges and single peaks outlined against the horizon. And room enough to set the ship down anywhere; the whole country was a landing field.

THE staff car, a bright colored moving speck on the silver road 1,000 feet below, speeded up, stopped at a small town, picked up a telegram. The bus stopped and a man climbed up on the top, wrote a message in crayon on the roof of the car. Co-pilot Massic took his binoculars out, read the message.

"Heavy winds between Tucson and Douglas," the message read.

We swung down low over the bus, dropped a note in reply. A man stood on each running board ready to catch it.

"We will stop at Tucson and take on full fuel load," Massic had written.

The ground crew signalled back, hurried ahead to arrange for the fuel.

It was higher and also hotter at the lonesome town of Tombstone. The helium, 10 degrees warmer than the surrounding air, expanded under the blazing sun until it had squeezed the ballonet flat, forcing out all of the air. We valved a little helium to keep the pressure down. We had ordered more helium delivered to San Antonio.

The last of the Coast range was well behind us at Douglas, and at El Paso the great barricade, which is the Rockies, lets down in a wide pass, 4,000 feet high. It should offer no difficulties, nor the hundred miles of rocky plains beyond it. The Guadeloupe Mountains would be the last barrier.

The Airways generally use the Del Rio route and have emergency landing points every 50 or 80 miles. The topography is rugged and rough and there is no place to set down between landing points. The pass itself is narrow and has an "S" turn in it, would require a skillful handling and a bit of luck for a low ceiling airship if caught in a tricky wind.

Davis Pass is a little lower and a little broader and the topography is much less rough. One could land on the plain if necessary almost anywhere. It is really just a broad entrance to the great plateau of high-lying cattle country of West Texas.

WITH 5,000 feet altitude, Davis Pass left a little margin for a ship with a ceiling not much higher than that, but by making our usual early morning start before the sun had warmed up and expanded the helium gas, we got through easily. We reached Fort Stockton at noon. We were still there when night fell.

The weather gods of Texas resented our invasion. An easterly gale began sweeping across the plateau and we decided to cruise around Fort Stockton until night, expecting the sunset lull which we knew in California, electing to spend the night there where supplies were at hand, rather than on the open plains. But the wind didn't die down with the sun. Instead it whooped it up all the more.

At sea, a wind of 40 miles per hour is considered gale proportions. We landed at sunset in a 40-mile wind which shifted in direction and velocity without warning. It is not difficult to land a ship in a high wind if the wind is reasonably constant; but it is a little harder when you have a period of absolute calm, and then without warning, get the impact of a 40-mile blow. It is much like being hit by a truck.

Once on the mast, the wind continued to try to dislodge its curious visitor, ramming, butting, tugging, trying to dislodge it. We fueled the ship, kept a crew aboard and the motors turning over in case the wind should succeed in tearing the ship loose and we had to fly the storm out. The ground crew stayed at the handling lines till one o'clock in the morning. Then Boreas got tired of the game and everyone but a couple of men on watch crawled up on the seats of the bus for a few hours' sleep. The 4:30 reveille came the next morning.

The wind having failed, the weather gods called out the fog. The sky was

(*Continued on page* 330)

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overcast as we left Junction, Texas, 185 miles from Fort Stockton. On a good day in Texas it seems that you can see almost to the Mississippi River. Today our visibility was about five miles, the ceiling was 1,000 feet, and both of them diminishing. By mid-morning the top of the bag was hidden by fog.

No airplane pilot likes to fly in fog despite the progress that has been made in developing instruments for blind flying. Instrument flying and human error still offer too much chance that the plane may get off equilibrium without the pilot knowing it and go into a fatal spin.

The lighter-than-air ship however, inherently stable, knows no such hazards. You don't loop a blimp and do not have stalls or spins. Its center of gravity is too low. A careful airplane pilot will fly around or over a fog belt or if these are impossible will set down. We might have gone aloft and cleared the fog, but Junction, Texas is 2,000 feet high already. And I did not want to lose sight of the ground crew in an unknown country. It seemed like a good time to land.

We were about midway between the towns of Junction and Kerrville,—about 30 miles from each one. The ground was rolling, rocky, covered with a scrub oak. I had kept the smoke of a distant sheep ranch in sight and now moved down toward it. The ground crew lined up in a clearing with perhaps 200 feet of open space between the out-buildings and the line of scrub oaks. By the time we got on the mast, the top half of the ship was completely hidden by fog.

There was plenty of room where we landed for a 134-foot ship, provided the wind remained in the same direction. But we had come to have a wholesome respect for Texas winds, had found that they changed direction without notice. Whatever the meteorological explanation, an airship on the mast must be free to swing around the full 360 degrees.

"May we cut down enough of that scrub oak so that the ship can swing around if the wind changes?" we asked the ranch owner.

"Take them all out if you want to," he replied. "I'll get you a couple of axes."

It was ten o'clock in the morning by now. We had been out since 4:30 with a slim breakfast to start. A big Packard car rolled down the road, came to a stop. A bronzed rancher got out to see what was going on. Presently a thought struck him.

"You boys happen to be hungry?" he asked.

Well, as a matter of fact we were.

"How many in the party?" he asked.

"Fourteen."

"All right, I'll be back," he said.

Half an hour later he returned with, I think, the biggest platter in the world, covered with 42 fried eggs—and with ham and bacon to match and an enormous pot of coffee.

"Come over to my ranch. It's only a few miles away. Bring your ship over and we'll barbecue a calf," he said.

HOWEVER, as long as the fog continued, it seemed no time to go visiting. We weren't bad off at that. The fog, like the wind, was doing no harm. We were relaxed, comfortable, the hospitable cattle man returned at night with 42 huge sandwiches and gallons of milk and coffee. We should worry.

But at midnight the weather god cleared away the fog, turned on a southeast wind of 20 miles an hour, shut that off; then at one o'clock without notice threw a norther at us. Four ground crew men, relaxed, were standing at the ropes. The Volunteer made a little jump, swung around 180 degrees, making the turn so quickly that two of the crew were knocked down into the brambles. Lucky that we had thought to clear out the scrub oaks.

The wind rose to 30, 40 miles an hour. Ominous black clouds moved in from the north, lightning flashed and thunder detonated over the hills. Moments of calm and of violent storm alternated. Then came a deluge of rain, and after and during that lightning storms. We had eight successive and separate thunder storms in 45 minutes. The wind stood at 45 and wrenched at the mast. We put additional screw stakes in the ground to hold the mast, everyone was straining on the ropes.

But lightning, thunder and rain and fog did the ship no harm. The storm had succeeded only in pulling a screw loose on the mast plate of the ship which we had patched with a wooden peg. And by 5:30 all was calm again in western Texas, the birds were singing—the sun came out. San Antonio with its broad hospitable hangar was 100 miles away. We omitted reveille since no one had had a chance to sleep. We quartered that night with the Army and took the opportunity to rest.

The rest of the trip was just flying. At Terre Haute we had our usual head winds to buck as we left.

"There must be favoring winds somewhere," said Massic. Let's go up and get them."

WE found them at 3,000 feet, dropped a message to the ground crew that we would see them at Akron. They wrote a hasty reply on the roof of the bus: "Wait at Akron till we get in." They had landed and launched us each day on the long journey across. They wanted to be in at the finish. We cruised around over Akron half the afternoon before we spotted them speeding down the highway to the Airport.

In the several days following at the helium purification plant at Akron, some 20,000 cubic feet of bracing California air was separated from the helium, released to mix with the grosser atmosphere of Ohio's Ruhr Valley. Any homesick ex-Californian might have welcomed it had he been there.

END

Bombing

(*Continued from page 298*)

The fuselage is small and so round and long as to resemble a cigar. The bombs are carried underneath the wings and not inside the fuselage as in present types. This ship, with its unofficial speed of over 180 miles per hour, marks a definite step forward for this type.

Another prominent manufacturer has developed a light Bomber known as a "gull wing" type, so called because when viewed from the front the wings drop into the fuselage as do those of a sea gull. This machine is powered with two 600-horsepower V-type liquid-cooled motors and does something like 200 miles per hour.

High performance airplanes are just one of the problems of Bombardment aviation. To many people a bomb is just so many pounds of dynamite, but to the initiated it resolves itself into a complicated mechanism of design, production and operation into which have gone years of research. As noted before, demolition bombs have been more or less standardized, according to weight, into a series which include 100, 300, 600, 1,100 and 2,000-pound bombs.

There are numerous other specialized types, including those used by Pursuit and Attack squadrons. These bombs are not to be thought of as just a container for the explosive. They must be built strong enough to penetrate heavy concrete and earth gun emplacements and certain types of protective armor.

THIS matter of penetration brings up the problem of designing a fuse that will not explode the bomb on impact but will give appreciable delay and penetration before going off. The idea of dropping 2,000 pounds of TNT from a height of three miles and having it so educated as not to go off instantly is one to which the Ordnance Department is giving much thought. In order to insure that a bomb once launched will proceed along a predetermined path, it has been necessary to provide them with fins somewhat after the manner of a Zeppelin. So equipped, the modern bomb has a remarkable degree of accuracy in its fall.

But this accuracy goes for naught unless we have some means of determining from what point the bomb must be released to hit the target. The fact that the plane at the instant of dropping will be going over 100 miles per hour makes quick and accurate work necessary. An airplane, unlike a dirigible, cannot hover over the target. On the contrary, it will be making its maximum speed. The bomb, then, will leave the ship in a horizontal position, with the same forward velocity as the plane. In falling, the nose gradually drops and the bomb becomes more nearly vertical as it falls.

Were it not for air resistance, the bomb would, if the airplane maintained its course, strike directly underneath it. Experiment has shown that a bomb released at a speed of 180 miles per hour from an altitude of 15,000 feet requires 32 seconds to reach the earth. In that time it will have traveled forward some eight thousand feet, or about a mile and a half. When it is remembered that there is only one point on our course from which this bomb will travel to the target, the problem confronting both the sight designer and the bomber is appreciated.

That progress has been made in the design of sights is indicated by the fact that the present instrument is five times as accurate as the best sight used during the war. Results, however, still depend on the training, skill and experience of the bomber. It is with the idea of reducing the personal factor that development is being continued. The ultimate achievement along this line is a sight with a small telescope which, when kept on the target by the bomber, signals the pilot for changes in direction and at the proper instant automatically releases the bomb.

Contrary to general belief, heavy bombardment rarely concerns itself with operations primarily against personnel. Their mission is the destruction of munitions factories, air depots, docks and shipyards, heavy fortifications, munitions dumps, railroad centers and naval vessels of all types.

This matter of targets brings closely to home the subject of the defense of Southern California. Surrounded as it is by a ring of mountains, with few passes, and with its shores offering possible landing places for enemy troops, it appears as a most vulnerable spot, particularly to an attack launched from the sea. The damage or destruction of the Los Angeles water system, the harbor at San Pedro, the huge stores of oil and gasoline, or the highways and railroads through the mountain passes would be disastrous.

We must not lose sight of one factor common to all air defense. This factor is mobility, the basic attribute of this arm which makes it possible to move a thousand miles over night and immediately go into action.

Rest assured that our air service armed with properly equipped bombing fleets will not only work havoc with enemy lines but destroy their morale as well.

END

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1/2 x 1	1 for 06	5/8 x 1 x 8	3 for .05
1 x 1	1 for 11	3/4 x 1½ x 9	3 for .05
1 x 2	1 for .20	3/4 x 1½ x 10	2 for .05
2 x 2	1 for .30	3/4 x 1½ x 11	1 for .04
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1½" long, for 1" and ¼" wheels, pair .14

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No rubber over 5 weeks old

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	225 feet .55
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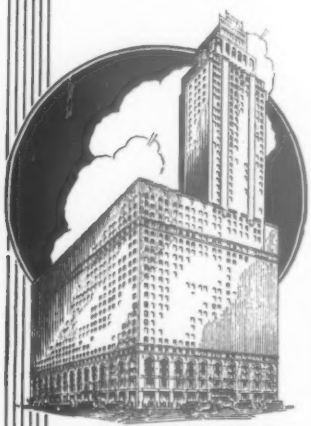

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Frank Luke

(*Continued from page* 282)

of Heroes. He was dead, but his fame and glorious career is undying.

Lieutenant Frank Luke, Jr., was posthumously awarded the Congressional Medal of Honor. He also won the Distinguished Service Cross with an oak leaf cluster.

The most controversial victory Luke won was while engaging in his first aerial duel. No one saw the fight; no one believed Luke when he returned and burst into Major Hartney's office, exclaiming excitedly: "I got a German!" Luke was branded as a liar.

This didn't worry Luke. He later handed in his written report, which has been made available by the U. S. Air Corps:

Combat report—August 16, 1918.

My machine was not ready, so left an hour after formation expecting to pick them up on the lines but could not find formation. Saw Hun formation and followed, getting above into the sun. The formation was strung out leaving one machine way in the rear. Being way above the formation, I cut my motor and dove down on the rear man, keeping the sun directly behind. Opened fire at about 100 *feet, keeping both guns on him until within a few feet, then zoomed away.*

When I next saw him he was on his back but looked as though he was going to come out of it, so I dove again holding both guns on him. Instead of coming out of it he sideslipped off the opposite side much like a falling leaf and went down on his back.

My last dive carried me out of reach of another machine that had turned about. They gave chase for about five minutes, then turned back for I was leading them. My last look at the plane shot down convinced me that he struck the ground, for he was still on his back about 1,500 *meters below.*

On coming home above our lines, saw four E. A. (Enemy Aircraft). Started to get into the sun and above, but they saw me and dove toward me. I hiked for home.

Three turned back and the other came on. I kept out of range by peaking slightly and he followed nearly to Coincy, where he saw one of the Ninety-fifth (Squadron) boys and turned about. The Ninety-fifth man could have brought down this E. A. if he had realized quick enough that it was an E. A.

The machine (the first he refers to) was brought down northeast of Soissons in the vicinity of Jouy and Vailly. Do not know the exact location as, this being my first combat, did not notice closely, but know that it was some distance within German territory, for Archies followed me for about ten minutes on my way back.

My motor was fixed at Coincy and filled with gas and oil. Also found out that our formation had been held up by the Salmson that it was to escort and had just started. Left the ground to find them. Flew at about 5,000 *meters from Soissons past Fismes but did not see the formation.*

Saw one Salmson but no E. A. Returned home.

END

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Timing Planes

(*Continued from page* 296)

revolving shade. In accordance with the rapid succession of the photographs and the high speed of the objects, the length of the exposure is such that about five photos per second can be taken. An object travelling at a speed of 180 km. per hour (108 m.p.h.) would be photographed at intervals of about 33 feet.

Simultaneously with the photographing of the moving object, occurs a registration of the angle of height and also the azimuth-angle of the telescope in such a way that the reading of these two circles (which lie close together) is also recorded upon the film by means of an optical system as may be seen from Fig. 2.

At the same time, the dial of a clockwork which is used for the identification of the observations (made simultaneously at the three different stations) is reproduced upon the film. By means of this clockwork it is also possible to ascertain without difficulty any gaps in the registrations. If the mechanism is timed with the central station to less than one-quarter second and the hand indicates a movement of half or three-quarters of a second, it is obvious that one or two registrations are missing. In other words, it was not possible for the observer to keep the airplane within focus of the telescope during the period in question.

END

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Parachutes

(*Continued from page* 284)

IMAGINE the feelings of Clyde Wallace, youthful commercial airplane pilot, who made an exhibition parachute leap at Tucson, Arizona, from an altitude of 2,000 feet when, alarmed because his fall was not checked, peered upward to find to his horror that his parachute was ripped from rim to rim, affording him a clear view of the blue sky instead of a silken canopy overhead. He still had about 900 feet of altitude and a precious few split seconds left before his impending doom. In feverish haste he yanked the ripcord of his emergency parachute and, although landing with a severe jolt, he was uninjured.

Only a week following Wallace's harrowing experience, another candidate for membership in the P. P. J. Circle was initiated under most tragic circumstances. Much of the joy that was Mary Fahrney's because of her miraculous escape from death was lost in the realization that her friend, Bruno Shustek, a parachute jumper, had lost his life in attempting to save hers.

Helpless in a tangled parachute, Miss Fahrney dangled for two hours beneath a plane from which she had attempted to jump at the Joliet, Ill., airport. She could not pull herself up to the plane and had given up hope that she would land alive when the parachute untangled itself, opened up and drifted her gently to earth. Miss Fahrney did not know until some time later that Schustek had been killed after attempting to save her. While his plane flew above hers at an altitude of 1,000 feet, he attempted to rescue her by climbing down a knotted rope. When her 'chute dropped of its own accord she was saved, but his strength was gone and he could not pull himself back up the rope to his own plane.

Harold Groves, of the Rankin Bros. Aviation School, Portland, Oregon, essayed to make an exhibition parachute jump some three weeks later. His greatest thrill occurred when, following his leap, his parachute split in two halves and cut loose. He is alive today to tell the story because he wore another 'chute for emergency purposes.

The following day, Emma Kingsmore, an exhibition parachute jumper, figured in a near tragedy at the Tulip Flying Field, near Bellingham, Wash. Shrouds of the exhibition 'chute worn by the 18-year-old girl fouled on the tail of the airplane as she jumped, leaving her dangling helpless under the plane.

Buroker, the pilot, headed for the Nooksack River, intending to take a chance on dropping the girl, when she pulled the ripcord of her emergency pack 'chute. It opened immediately, jerking the fouled exhibition 'chute free of the ship. The pack 'chute let her down easily and without mishap.

The only Army Air Corps member of the P. P. J. Circle, Private Harold J. Osborne, received his membership card on the day he was scheduled to graduate from the Parachute Riggers' course at the Air Corps Technical School, Chanute Field, Rantoul, Ill. It has been the custom for students about to graduate from this course to make at least one practice parachute jump as a sort of final examination and on this particular day five 0-25 Observation planes took the air, each carrying a jumper. Successful jumps were made by four of the men, but the fifth man, Private Osborne, met with a mishap.

When 2,000 feet over the flying field, Osborne hurled himself into space. Unfortunately, he was a bit too previous with the ripcord of his parachute and pulled it before he actually jumped, so that the opened silken canopy fouled the counterbalance of the right elevator of the plane. Immediately the parachute tore from skirt to center reinforcement, leaving him suspended by a pair of shroud lines.

LIEUT. Charles H. Deerwester, the pilot, was having his troubles also. The moment the parachute fouled the flipper, the plane was suddenly checked, lost about 20 miles in air speed and showed an insatiate desire to climb to the moon. Fortunately, the engine was equal to the task, but, in order to keep the plane level even after full stabilizer correction had been made, a strong arm was required. The lieutenant managed it for almost an hour until he was finally relieved of his unusual load. In the meantime, Osborne kept his head and preserved his strength for what appeared to be his only chance to eat again at the Chanute Field General Mess.

As soon as it became evident that Osborne could not release himself, things began moving in a lively fashion on the field. Among the numerous volunteers, one armed with a sickle, another with a butcher knife and others with all sorts of cutlery, Lieuts. Howard E. Engler and Austin A. Straubel were chosen. Taking off in an 0-25 plane bearing the inscription "Follow Me" chalked on its side, these officers overtook Lieut. Deerwester's plane. Lieut. Straubel succeeded in lowering a pocket knife in a shot bag suspended by a light cord to Private Osborne. This was by no means easy, due to the violent swinging of the hapless man, but it was finally effected. As he grasped the swinging knife, his entire outlook towards life changed immediately. He cut the two shroud lines, fell free, opened his emergency 'chute and made a safe and slow descent into a soft field.

When the American Legion of Philadelphia staged an aviation meet at the Municipal Airport, William Kelly, a sergeant of the Pennsylvania National Guard, was down on the program for a parachute jump and he literally put his foot in it. He leaped from the plane at an altitude of 2,000 feet, but somehow or other the parachute was fouled by his foot. After struggling manfully to tear the shoe off his foot, he pulled his emergency parachute when not more than about 125 feet from the ground. He landed safely near the banks of the Schuykill River.

END

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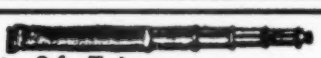

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Views on Races

(*Continued from page 300*)

land next year—while the audience attends the Pageant of Progress in Chicago. Perhaps we can solve the problem by erecting stands in Chicago with loud speakers and television arrangements, and view the race by remote control.

At this point, I remove from my bookshelf a dusty tome entitled "Proceedings of the International Conference on Aerial Navigation, Chicago, 1893," and reflect that this was the conference at the World's Fair which practically heralded the beginning of aviation in America.

Quoting from the book, I learn that "The proposal to hold an International Conference on Aerial Navigation in Chicago during the Columbian Exposition first originated with Professor A. F. Zahm, of Notre Dame University" and among the remarkable contributions to knowledge presented at the conference I find "The Internal Work of the Wind," by Samuel P. Langley, papers by Octave Chanute, inventor of the biplane, Lawrence Hargrave, L. P. Mouillard, inventor of the "full differential" aileron, and about two dozen other serious thinkers.

It was to be hoped that Professor Zahm or some other qualified authority would arise in these troubled times and send out a clarion call for an International Congress for Aerial Navigation at Chicago in 1933 to include demonstrations and racing of modern machines. Steps are being taken to organize a committee for action along these lines and progress will be reported in POPULAR AVIATION.

END

Radio Beacon

(*Continued from page 310*)

between loops and transmitter are transposed at intervals.

The complete power supply for the transmitter for either aural or visual type of beacon is obtained from the gasoline engine generator unit, consisting of an engine and six generators. The engine is 10 hp., 4 cylinder, 4 cycle, 1800 rpm., water cooled, and equipped with a mechanical governor for speed control. Coupled to the engine through a Falk spring type flexible coupling is a 500 watt, 110 volt exciter and a 750 watt, 2500 volt plate generator.

END

Builders

(*Continued from page 315*)

this ship in the professional class yet this is not the case for the reason that neither of the three men are true aircraft engineers. Any group of boys, versed in mechanical drawing and practical mechanics, can do what we accomplished under the proper guidance.

The "Wyandotte Pup" has a wing span of nearly 32 feet and an overall length of 21 feet. It is powered with a 50 h.p. Aeromarine engine and has a cruising speed between 80-85 m.p.h. The top speed is 100 m.p.h. and it lands at 30-35 m.p.h. It is a two-place cabin plane, tandem seated with dual control. It has a gasoline capacity of 12.5 gallons. The empty (dry) weight is 610 pounds. Fully loaded it weighs 1,035 pounds.

This ship is provided with an adjustable stabilizer for taking care of variable passenger loads and is also provided with a neat baggage compartment located in the streamlining of the fuselage just back of the passenger. The manufactured price, with an Approved Type Certificate, will probably be between $1,790 and $1,825, flyaway.

Plans for building the ship will be available for amateur builders just as soon as we receive our Approved Type Certificate. We also plan to sell the parts of the plane, unassembled, so that the amateur can buy the parts and assemble his own plane. The cost complete, with engine, will then be approximately $1,000. If I can be of any help to P. A. readers, or give further details of the plane, I will answer all inquiries upon receiving a self-addressed stamped envelope. Guy F. House, 3109 Parallel Ave., Kansas City,

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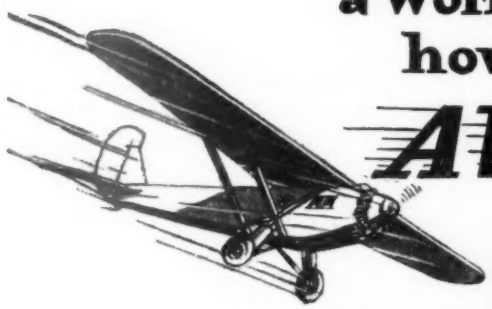

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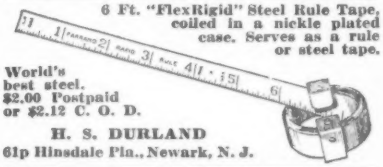

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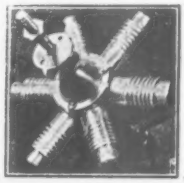

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Just think of it—a complete plane ready to assemble, eligible for Dept. of Com. License for only $399.00 (less motor). May be licensed with either Heath B4 Engine $300.00, or Continental A40—$450.00. Price made possible by large scale production methods. You need only $16.00 for first group of parts. Order balance as desired and pay as shipped.

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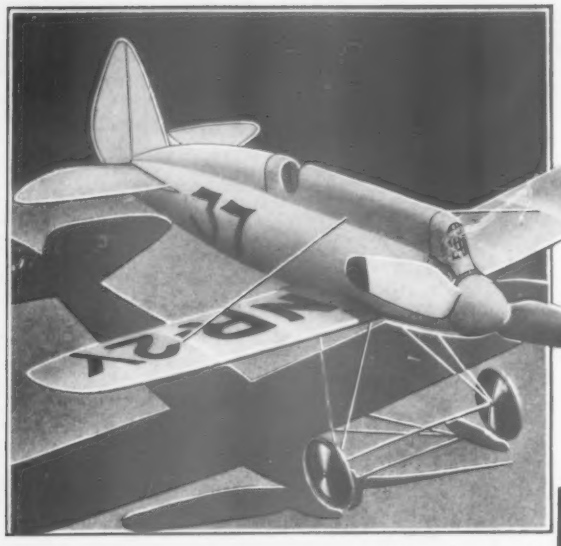

Big, complete Sling-Shot GLIDER given free with EACH kit ordered from this ad. Glides, loops, stunts! Fun galore! **FREE**, new **Wonder** 5-color CATALOG, with each order! **FREE**, amazing new Bates Jr. Celluloid **formed** propeller YOURS FREE with each $1 kit ordered! But ORDER QUICK as **all 3 Free Offers** Good Limited Time Only! Read entire ad —HURRY! Send coupon!

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Read what John Etherington of N. Y. writes: "Enclosed is 75c for ANOTHER Howard Flying Scale. The last Racer reached me in perfect condition—the finished model FLIES beautifully—**averaging 750 feet each flight!**" **That's the kind of** FLYING **scale** you want, boys — and that's **the kind Comet specializes** on giving you! The photo shows how sleek, trim, realistic it looks—**and how she flies!** E. M. Farver of Ohio says: "Flew my Comet Howard Racer nearly **900 feet—150 feet high!**" COMPLETE kit packed in neat, strong box with Free Glider! Oh, what a thrill awaits you! Order now! 75c prepaid!

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SAVE CASH! Order kits in GROUPS—**Group 1:** Dipper, Howard, Red Racer, $2 prepaid. **Group 2:** Dipper, Howard, Bullet, $2 prepaid. **Group 3:** Dipper, Pursuit, Red Racer, $2 prepaid. **Group 4:** Dipper, Pursuit, Bullet, $2 prepaid. 3 Free Gliders **with each Group!** One Free Celluloid "prop" **with each Group! Offer good limited time, so order**—send coupon NOW!

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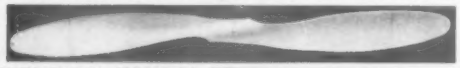

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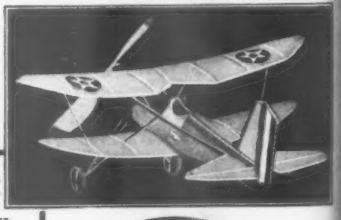

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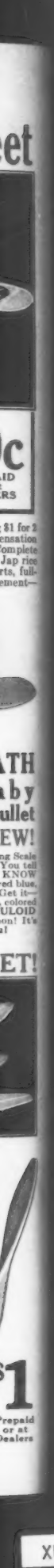
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